CMR COLLEGE OF ENGINEERING& TECHNOLOGY
(Autonomous)
Kandlakoya, Hyderabad – 501 401

ACADEMIC REGULATIONS R 18 FOR CBCS & OUTCOME BASED B.TECH. REGULAR PROGRAMMES

(Effective for the students admitted into I year for the Academic Year 2018-19)

1.0 Under-Graduate Degree Programme in Engineering & Technology

CMR College of Engineering & Technology, Hyderabad offers 4 Years (8 Semesters) Bachelorof Technology (B.Tech.) degree Programme, under Choice Based Credit System (CBCS), with effect from the Academic Year 2018 - 19 and onwards, in the following Branches of Engineering.

S.No.	Branch
I.	Civil Engineering
II.	Electrical & Electronics Engineering
III.	Mechanical Engineering
IV.	Electronics & Communication Engineering
V.	Computer Science & Engineering

2.0 Admission Procedure

2.1. Admissions will be done as per the norms prescribed by the Government of Telangana. The Government orders in vogue shall prevail.

2.2. The candidate should have passed the qualifying examination Intermediate or equivalent on the date of admission.

2.3. Seats in each program in the college are classified into Category–A (70% of intake) and Category-B (30%of intake) besides Lateral Entry. Category-A seats will be filled by the Convener, TSEAMCET Admissions. Category-Bseats will be filled by the College as per the guidelines of the Competent

Authority.

2.4. Lateral Entry seats for 20% of the candidates from the approved strength of the course shall be admitted into the III Semester directly based on the rank secured by the candidate in TSECET in accordance with the guidelines from the Competent Authority.

2.5 The medium of instruction for the entire UG Degree Course in Engineering & Technology (E&T) shall be ENGLISH only.

3.0 B.Tech. Degree Course Structure

3.1 The B.Tech. Programmes of CMR College of Engineering & Technology are of semester pattern, with 8 Semesters constituting 4 Academic Years, each Academic Year having two Semesters (First/Odd and Second/Even). Each Semester shall have a minimum of 90 Instructional Days.

3.2 UGC/ AICTE specified Definitions/ Descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are as listed below. The Course Structure is organized based on the AICTE Model Curriculum for Under-Graduate Degree Courses in Engineering & Technology (Jan. 2018).

3.2.1 Semester Scheme:

Each UG Programme is of 4 Academic Years (8 Semesters), with the year being divided into two Semesters of minimum 90 Instructional days/Semester and in addition each Semester having - ‘Continuous Internal Evaluation (CIE)’ and ‘Semester End Examination (SEE)’. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted by UGC, and Curriculum/ Course Structure as suggested by AICTE are followed.

3.2.2 Course Credits:

The Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Course in a L: T: P: C (Lecture Periods: Tutorial Periods: Practicals Periods : Credits) Structure, based on the following general pattern.

- One Credit - for One hour/ Week/ Semester for Theory / Lecture (L) / Tutorial Courses; and,
- One Credit – for Two hours / Week / Semester for Laboratory / Practical (P) Courses

Other student activities like NCC, NSS, NSO, Induction Program, Study Tour, Guest Lecture etc., and other Courses identified as Mandatory Courses (MC) shall not carry Credits.

3.2.3 Course Classification:

All Courses offered for the UG Programme are broadly classified as:

(a) Foundation Courses (Fn C)
(b) Core Courses (Co C)
(c) Elective Courses (Eℓ C)

- **Foundation Courses** (Fn C) are further categorized as :
  i. HSMC (Humanities, Social Sciences and Management Courses)
  ii. BSC (Basic Science Courses)
  iii. ESC (Engineering Science Courses)

- **Core Courses**(Co C) and Elective Courses (Eℓ C) are categorized as PS (Professional Subjects), which are further subdivided as –
  i. PCC (Professional Core Courses)
  ii. PEC (Professional Elective Courses)
  iii. OEC (Open Elective Courses)
  iv. PROJ (Project)
- **Minor Courses** (1 or 2 Credit Courses, belonging to HSMC/ BSC/ ESC/ PCC as per relevance); and
- **Mandatory Courses** (MC - Non-credit oriented).

3.2.4 Course Nomenclature:

The Curriculum Nomenclature or Course-Structure Grouping for the each of the UG PROGRAMME E&T (B.Tech. Degree Programmes), is as listed below:

S. No.	*Broad CourseClass ificati-on*	*Course Group/ Category*	*Course Description*	*Suggested Breakup of Credits by AICTE(160)*
1	**Foundation Courses (Fn C)**	**BSC – Basic Science Courses**	Includes - Mathematics, Physics and Chemistry Subjects	**25***
2		**ESC - Engineering Science Courses**	Includes fundamental engineering subjects	**24***
3		**HSMC – Humanities and Social Sciences including Management Courses**	Includes subjects related to Humanities, Social Sciences and Management	**12***
4	**Core Courses (Co C)**	**PCC– Professional CoreCourses**	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engg.	**48***
5	**Elective Courses (Eℓ C)**	**PEC – Professional Elective Courses**	Includes Elective subjects related to the Parent Discipline/ Department/ Branch of Engg.	**18***

6		**OEC – Open Elective Courses**	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department/ Branch of Engg.	**18***
7		**Project**	B.Tech. Project or UG Project or UG Major Project	**15***
8		**Industrial Training/ Mini- Project**	Industrial Training/ Internship/ UG Mini-Project/ Mini-Project	
9	**Core Courses**	**Seminar**	Seminar/ Colloquium based on core contents related to Parent Discipline/ Department/ Branch of Engg.	
10		**Mandatory Courses (MC)**	Mandatory Courses (non-credit)	**Nil**
Total Credits for B. Tech. Programme				**160**

* Minor variation is allowed as per need of the respective disciplines.

4.0 Course Work

4.1 A student, after securing admission, shall pursue the B.Tech. UG Programme in a minimum period of 4 Academic Years, and a maximum period of 8 Academic Years (starting from the Date of Commencement of I Year).

4.2 As suggested by AICTE, ‘Mandatory Induction Programme’ shall be offered for all the Branches of Engineering at the start of the I Year UG Degree Course, to enable the newly admitted students get acquainted with the new professional environment, to develop awareness and understanding of the engineering education requirements, and to get them prepared for the academic schedules ahead. The features, activities and pattern of the Induction Programme shall be as per the guidelines suggested in the AICTE Model Curriculum.

4.3 Each student shall Register for and Secure 160 Credits for the completion of the UG Programme and the Award of the B.Tech. degree in the respective branch of Engineering.

5.0 Course Registration

5.1 A 'Faculty Advisor or Counselor' shall be assigned to each student, who will advise him about the UG Programme, its Course Structure and Curriculum, Choice/Option for Subjects/ Courses for the purpose of registration, based on his competence, progress, pre-requisites and interest.

5.2 The Academic Section of the College invites 'Registration Forms' from students apriorie (before the beginning of the Semester), through 'on-line submissions', ensuring 'DATE and TIME Stamping'. The On-line Registration Requests for any 'Current Semester' shall be completed before the commencement of SEEs (Semester End Examinations) of the 'Preceding Semester'.

5.3 Students are advised to individually register for all the number of credits indicated in that semester workload of the respective UG Degree Course Structure - this is termed as the 'Semester Work Load' (SWL).

5.4 A student can apply for ONLINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his assigned Faculty Advisor, which should be submitted to the College Academic/Examination Section through the Head of the Department (a copy of the same is to be retained by the Head of the Department, Faculty Advisor and the student).

5.5 A student may be permitted to register for the courses in a semester of his choice subject to para 5.4 with the typical work load suggested in the course structure of that semester. A student may register for courses over and above the courses listed in the course structure of the semester with possible additional courses of his choice, limited to a maximum of 3 Credits, based on his PROGRESS and SGPA/ CGPA, and completion of the 'PRE-REQUISITES' as indicated for various Subjects/ Courses in the Department Course Structure and Syllabus contents.

5.6 The choice for the 'additional' Courses above the typical SWL must be indicated clearly, which needs the specific approval and signature of the Faculty Advisor/ Counselor and the HoD on the hard-copy.

5.7 If the Student submits ambiguous choices or multiple options or erroneous entries - during On-Line Registration for the Course(s) under a given/ specified Course Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that Category will be taken into consideration, as applicable.

5.8 The Course Options exercised through 'ON-LINE' Registration are final and CANNOT be changed; further, alternate choices will also not be considered. However, if the Course that has already been listed for Registration (by the Head of Department) in a Semester and could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Course (subject to offering of such a Course), or for another existing Course (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

5.9 Dropping of the Courses may be permitted ONLY AFTER obtaining the prior approval from the Faculty Advisor assigned and the Head of the department (subject to the retaining of the SWL), 'within 15 Days of Time' from the beginning of the current semester.

5.10 For Mandatory Courses like NCC/ NSS/ NSO etc., a 'Satisfactory Participation Certificate' from the concerned authorities for the relevant Semester is essential. No Marks or Grades or Credits shall be awarded for these activities.

6.0 Courses to be offered

6.1 A typical Section (or Class) Strength for each Semester shall be 60.

6.2 An Elective course may be offered to the Students, ONLY IF a Minimum of 20 Students (1/3 of the Section Strength) opt for the same. The Maximum Strength of a Section is limited to 80 (60 + 1/3 of the Section Strength).

6.3 More than one teacher may offer the same Course (Laboratory/ Practicals may be included with the corresponding Theory Course in the same Semester) in any Semester. However, selection choice for students will be based on - 'first come first serve Basis and CGPA Criterion' (i.e., the first focus shall be on early on-line entry from the student for Registration in that Semester, and the second focus, if needed, will be on CGPA of the student). The decision of the Head of the department in this regard is final.

6.4 If more entries for Registration of a course come into picture, the Head of the Department shall decide on offering of such a Course.

7.0 Attendance Requirements

7.1 A student shall be eligible to appear for the End Semester Examinations, if he acquires a minimum of 75% of attendance in aggregate of all the Courses (excluding Mandatory or Non-Credit Courses) for that Semester.

7.2 Condoning of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each Semester may be granted by the College Academic Committee on genuine and valid medical grounds, based on the student's representation with supporting evidence. Provision of such condonation is however limited to a maximum of 3 times during the maximum permissible UG study period.

7.3 A stipulated fee shall be payable towards condoning of shortage of attendance.

7.4 Shortage of Attendance below 65% in aggregate shall in NO case be condoned.

7.5 Students, whose shortage of attendance is not condoned in any Semester, are not eligible to appear for End Examinations of that Semester. Such students are detained and their registration for that Semester shall stand cancelled. They will not be promoted to the next Semester. They may seek re-registration for all those Courses registered in that Semester in which they got detained, by seeking re-admission for that Semester as and when offered; in case if there are any Professional Electives and/ or Open Electives, the same may also be re-registered if offered, however, if those Electives are not offered in later Semesters, then alternate Electives may be chosen from the SAME set of Elective Courses offered under that category.

8.0 Academic Requirements

The following Academic Requirements have to be satisfied, in addition to the Attendance Requirements mentioned in Item No.**7.**

8.1 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to each Subject/ Course, if he secures not less than 35% marks (25 out of 70 marks)in the End Semester Examination, and a minimum of 40% of marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades, this implies securing '**P**' Grade or above in that Subject/ Course.

8.2 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to Technical Seminars, if he secures not less than 40% of the total marks to be awarded. The student would be treated as failed, if he -

(i) Does not present the technical Seminars as required in the VI and VIII Semesters, or

(ii) Secures less than 40% of marks in Technical Seminar Evaluations.

He may reappear once for each of the above evaluations, when they are scheduled again; if he fails in such ‘one reappearance’ evaluation also, he has to reappear for the same in the next subsequent Semester, as and when it is scheduled.

8.3 A Student will not be promoted from I Year to II Year, unless he fulfils the Attendance and Academic Requirements and secures a minimum of total 19 Credits of I Year, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.4 A Student will not be promoted from II Year to III Year, unless he fulfils the Attendance and Academic Requirements and secures a minimum of total 47 Credits up to IV Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.5 A Student will not be promoted from III Year to IV Year, unless he fulfils the Attendance and Academic Requirements and secures a minimum of total 72 Credits up to VI Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.6 A Student shall - register for all courses covering 160 credits as specified and listed (with the relevant Course Classifications as mentioned) in the course structure, put up all the Attendance and Academic requirements for 160 credits securing a minimum of ‘P’ Grade (Pass Grade) or above in each Course, and ‘earn All 160 credits securing SGPA $\geq$ 5.0 (in each Semester), and CGPA (at the end of each successive Semester) $\geq$ 5.0, to successfully complete the UG Programme.

8.7 If a student registers for any ‘additional courses’ (in the parent Department or other Departments/Branches of Engg.) other than those listed Subjects totaling to 160 Credits as specified in the Course Structure of his Department, the performances in those ‘additional Courses’ (although evaluated and graded) shall not be taken into account while calculating the SGPA and CGPA. For such 'additional Courses ' registered, the % of marks and the Letter Grade alone shall be indicated in the Grade Card as a performance measure subject to the completion of the Attendance and Academic Requirements as stated under Clauses 7.0 and 8.1 – 8.7.

8.8 Students who fail to earn 160 credits as per the course structure, and as indicated above, within 8 Academic Years from the Date of Commencement of their I Year shall forfeit their seats in B.Tech. Programme and their admissions shall stand cancelled.

8.9 When a Student is detained due to shortage of attendance in any Semester, he may re-register for that Semester, as and when offered, with the Academic Regulations of the Batch into which he re-registers. However, no Grade Allotments or SGPA/ CGPA calculations will be done for that entire Semester in which he got detained

8.10 When a Student is detained due to lack of Credits in any year, he may re-register for the next year, after fulfilment of the Academic Requirements, with the Academic Regulations of the Batch into which he re-registers.

8.11 A student who is eligible to appear in the End Semester Examination in any Course, but was absent for it or failed (thereby failing to secure P Grade or above), may reappear for that Course at the supplementary examination as and when conducted. In such cases, his Internal Marks (CIE) assessed earlier for that Course will be carried over, and added to the Marks to be obtained in the supplementary examination, for evaluating his performance in that Course.

9.0 Evaluation - Distribution and Weightage of Marks

9.1 The performance of a student in each Semester shall be evaluated Subject-wise (irrespective of Credits assigned) with a maximum of 100 marks for Theory or Practicals or Seminar or Drawing / Design or Minor Course or Major Project Phase-I or Major Project Phase-II. These evaluations shall be based on CIE (Continuous Internal Evaluation) and SEE (Semester End Examination), and a Letter Grade corresponding to the % marks obtained shall be given.

9.2 For Theory subjects 30 marks are allocated for Continuous Internal Evaluation. Continuous Internal Evaluation during a semester is based on two internal examinations conducted during the semester. 70 marks are allocated for the Semester End Examination SEE.

(a) Each internal examination consists of two parts, part-A consisting of 5 short answer questions carrying two marks each, Part-B consisting of 3 essay type questions carrying 5 marks each with a total duration of 1 hour 40 minutes. The essay paper shall contain one question from each unit with internal choice. While the first internal examination shall be conducted from 1 to 2.5 units of the syllabus, the second internal examination shall be conducted on 2.5 to 5 units. Five (05) marks are allocated for Assignment (as specified by the subject teacher concerned). There will be two assignments in the semester for each course consisting of 5 marks each. The first Assignment should be submitted before the conduct of the first internal examination and second Assignment should be submitted before the conduct of the second internal examination.

(b) The total marks secured by the student in each internal examination are evaluated for 30 marks. The final marks secured in internal evaluation by each candidate are arrived at by giving a weightage of 70% to the best secured internal examination and 30% weightage to the least secured internal examination. A student who is absent from any assignment/ internal examination for any reason what so ever shall be deemed to have secured ‘zero’ marks in the test / examination and no makeup test/ examination shall be conducted.

9.3 For Practical Subjects, there shall be a Continuous Internal Evaluation (CIE) during the Semester for 40 internal marks, and 60 marks are assigned for Laboratory/Practical End Semester Examination (SEE).Out of the 40 marks for internals, day-to-day work in the laboratory shall be evaluated for 30 marks; and for the remaining 10 marks - internal practical test shall be conducted by the concerned laboratory teacher. For Practical Subjects, the end semester examination SEE shall be conducted with an external examiner and the laboratory teacher. The external examiner from other institutions or industry shall be appointed by the Controller of Examinations.

9.4 For the subjects having design and / or drawing, (such as Engineering Graphics, AutoCAD, Engineering Drawing, Machine Drawing and Estimation etc.,) the internal evaluation carries 40 marks (the distribution is 20 marks for day-to-day work and 20 marks for internal examination) and 60 marks shall be for end semester examination. There shall betwo internal examinationsin a semester. The final marks secured by each candidate in the internal evaluation is arrived at by giving a weightage of 70% to the best secured internal examination and 30% weightage to the least secured internal examination.

9.5 Open Electives (OE): Students have to choose four Open Electives during the programme by meeting pre-requisite of the course if any. However, students cannot opt for open elective course if it is already studied by the student as part of Professional Elective or any other category. The Courses offered under Open Electives in an academic year will be reviewed and finalized by the College Academic Committee before the commencement of the academic year.

9.6 There shall be a Mini-Project-I/ Internship-I, to be taken up in the college or industry during the summer vacation after IV Semester examination. The Mini-Project-I/ Internship-I shall be evaluated during the V Semester. The Mini-Project-I/Internship-

I shall be submitted in a report form and should be presented before a committee, which shall be evaluated for Satisfactory or Non-satisfactory. The committee consists of Head of the Department, the supervisor of Mini-Project-I/Internship-I, a senior faculty member of the department.

9.7 There shall be a Mini-Project-II/ Internship-II, to be taken up in the college or industry during the summer vacation after VI Semester examination. The Mini-Project-II/ Internship-II shall be evaluated during the VII Semester.The Mini-Project-II/ Internship-II shall be submitted in a report form and should be presented before a committee, which shall be evaluated for Satisfactory or Non-satisfactory. The committee consists of Head of the Department, the supervisor of mini project, a senior faculty member of the department.

9.8 There shall be a Technical Seminar-I presentation in VI Semester. For the Technical Seminar-I, the student shall collect the information on a specialized topic related to his branch other than Mini projects-I & II/ Internships-I & II/ Major Projects Phase-I & II topic with due approval of the Head of the department and prepare a technical report and submit to the department. The presentation demonstrating understanding of the topic and technical report shall be evaluated by a Departmental committee consisting of the Head of the department, Technical Seminar-I supervisor and a senior faculty member from the department. The Technical seminar will be evaluated for 100 marks. There shall be no SEE or external examination for the Technical Seminar-I.

9.9 There shall be a Technical Seminar-II presentation in VIII Semester. For the Technical Seminar-II, the student shall collect the information on a specialized topic related to his branch other than the Mini projects-I & II/ Internships-I & II/ Major Projects Phase-I & II topic with due approval of the Head of the department and prepare a technical report and submit to the department. The presentation demonstrating understanding of the topic and technical report shall be evaluated by a Departmental committee consisting of the Head of the department, Technical Seminar-II supervisor and a senior faculty member from the department. The Technical Seminar-II will be evaluated for 100 marks. There shall be no SEE or external examination for the Technical Seminar-II.

9.10 Each student shall start the Project Work during the VII Semester as per the instructions of the Project Guide/ Project Supervisor assigned by the Head of the Department.

a) The Project Work shall be divided and carried out in 2 phases : Phase – I (Project-I) during VII Semester, and Phase – II (Project-II) during VIII Semester, and the student has to prepare two independent Project Work Reports – *one each during each phase*. First Report shall include the Project Work carried out under Phase – I, and the Second Report (Final Report) shall include the Project Work carried out under Phase – I and Phase – II put together. Phase – I and Phase – II of the Project Work shall be evaluated for 100 marks each.

b) Out of the total 100 marks allotted for each Phase of the Project Work, 40 marks shall be for the Continuous Internal Evaluation(CIE), and 60 marks shall be for the End Semester Viva-voce Examination (SEE). The marks earned under CIE for both Phases of the Project shall be awarded by the Project Guide/Supervisor (based on the continuous evaluation of student's performance during the two Project Work Phases/periods); and the marks earned under SEE shall be awarded by the Project Viva-voce Committee/ Board (based on the work carried out, report prepared and the presentation made by the student at the time of Viva-voce Examination).

c) For the Project Phase - I, the Viva-voce shall be conducted at the end of the VII Semester, before the commencement of the semester End Examinations, at the Department Level by a Committee comprising of the HoD or One Professor and Supervisor (no external examiner), and the Project Phase – II Viva-voce (or Final Project Viva-voce) shall be conducted by a Committee comprising of an External Examiner, the Head of the Department and the Project Supervisor at the end of the VIII Semester, before the commencement of the semester End Examinations. The External Examiner shall be nominated by the CoE from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the HoD.

d) If a student does not appear for any of the two Viva-Voce examinations at the scheduled times as specified above, he may be permitted to reappear for Project Phase-I and/or Project Phase-II Viva-voce examinations, as and when they are scheduled in that semester; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester(s), as and when they are scheduled, as supplementary candidate. For the registration of Project Phase-II the student must have passed Project Phase-I.

9.11 For NSS / NSO Mandatory Courses and/or any other Mandatory Non-Credit Course offered in a semester, a 'Satisfactory Participation Certificate' shall be issued to the student from the authorities concerned, only after meeting the minimum attendance requirements in the Course. No Marks or Letter Grade shall be allotted for the Mandatory Courses.

10. 0. Semester End Examination (SEE)

10.1. Theory Courses

The end semester examination will be conducted for 70 marks which consist of Part-A and Part-B. The examination is for 3 hours duration. Question paper pattern is as follows.

Part-A: 20 Marks

There shall be 10 questions each carrying 2 Marks. (Two questions from each Unit)

Part-B: 50 Marks

There shall be 10 questions out of which 5 questions (Internal choice within a unit i.e. two questions from each unit out of which one question to be answered) are to be answered, each question carry 10 marks.

10.2. Laboratory Courses

Each laboratory course is evaluated for 60 marks. The examination shall be conducted by the laboratory teacher and one external examiner appointed by the Controller of Examinations from other institutions or industry in consultation with the Head of the Department.

10.3. Supplementary Examinations

The schedule for supplementary examinations shall be as notified by the institute from time to time.

10.4. For NCC/ NSS/ NSO types of Courses, and/or any other Mandatory Non-Credit Course offered in a Semester, a ‘Satisfactory Participation Certificate’ shall be issued to the Student from the concerned authorities, only after meeting minimum attendance requirements in the Course. No marks or Letter Grade shall be allotted for these activities and it will not be part of calculation of CGPA.

11.0. Grading Procedure

11.1. Marks will be awarded to indicate the performance of each student in each Theory Course, or Laboratory Course, or Technical Seminar, or Project etc., based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination). As a measure of the student’s performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed …

% of Marks Secured (Class Intervals)	***Letter Grade (UGC Guidelines)***	***Grade Points***
100% or below but not less than 85% (≥ 85% ,<= 100%)	**O (Excellent)**	**10**
Below 85% but not less than 70%	**A**	**9**

(≥ 70% ,< 85%)	**(Very Good)**	
Below 70% but not less than 60% (≥ 60% ,< 70%)	**B** **(Good)**	**8**
Below 60% but not less than 55% (≥ 55% ,< 60%)	**C** **(above Average)**	**7**
Below 55% but not less than 50% (≥ 50% ,< 55%)	**D** **(Average)**	**6**
Below 50% but not less than 40% (≥ 40% ,< 50%)	**P** **(Pass)**	**5**
Below 40% (< 40%)	**F** **(FAIL)**	**0**

11.2 A student obtaining F Grade in any Subject shall be considered ‘failed’ and will be required to reappear as ‘Supplementary Candidate’ in the Semester End Examination (SEE), as and when offered. In such cases, his Internal Marks (CIE Marks) in those Subject(s) will remain same as those he obtained earlier.

11.3. A Letter Grade does not imply any specific % of Marks.

11.4. In general, a student shall not be permitted to repeat any Course(s) only for the sake of ‘Grade Improvement’ or ‘SGPA/ CGPA Improvement’. However, he has to repeat all the Courses pertaining to that Semester, when he is detained (as listed in Items 8.10- 8.11).

11.5. A student earns Grade Point (GP) in each Course, on the basis of the Letter Grade obtained by him in that Course (excluding Mandatory non-credit Courses). Then the corresponding ‘Credit Points’ (CP) are computed by multiplying the Grade Point with Credits for that particular Course.

Credit Points (CP) = Grade Point (GP) x Credits …. For a Course

11.6. The Student passes the Course only when he gets GP ≥ 5 (P Grade or above).

11.7. The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

SGPA = $\{\sum_{i=1}^{N} C_i G_i\} / \{\sum_{i=1}^{N} C_i\}$ .... For each Semester,

Where **'i'** is the Course indicator index (takes into account all Courses in a Semester), 'N' is the no. of Courses 'REGISTERED' for the Semester (as specifically required and listed under the Course Structure of the parent Department), C_i is the no. of Credits allotted to the **i**th Course, and G_i represents the Grade Points (GP) corresponding to the Letter Grade awarded for that **i**th Course.

11.8. The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the I Year Second Semester onwards, at the end of each Semester, as per the formula

CGPA=$\{\sum_{j=1}^{M} C_j G_j\} / \{\sum_{j=1}^{M} C_j\}$... for all S Semesters registered

(ie., upto and inclusive of S Semesters, S ≥ 2),

Where 'M' is the Total no. of Courses (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' from the 1st Semester onwards up to and inclusive of the Semester S (obviously M > N), '**j**' is the Course indicator index (takes into account all Courses from 1 to S Semesters), C_j is the no. of Credits allotted to the **j**th Course, and G_j represents the Grade Points (GP) corresponding to the Letter Grade awarded for that **j**th Course. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

11.9. For Merit Ranking or Comparison Purposes or any other listing, ONLY the 'ROUNDED OFF' values of the CGPAs will be used.

11.10. For Calculations listed in Item 11.5– 11.8, performance in failed Courses (securing F Grade) will also be taken into account, and the Credits of such Courses will also be included in the multiplications and summations. However, Non-Courses will not be taken into consideration.

12.0. Passing Standards:

12.1. A student shall be declared successful or 'passed' in a Semester, only when he gets a SGPA ≥ 5.00 (at the end of that particular Semester); and a student shall be declared successful or 'passed' in the entire UG PROGRAMME, only when he gets a CGPA ≥ 5.00; subject to the condition that he secures a GP ≥ 5 (P Grade or above) in every registered Course in each Semester (during the entire UG PROGRAMME) for the Degree Award, as required.

12.2. A Student shall be declared successful or 'passed' in any Non-Credit Course, if he secures a 'Satisfactory Participation Certificate' for that Mandatory Course.

12.3. After the completion of each Semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the Registered Students of that Semester, indicating the Letter Grades and Credits earned. It will show the details of the Courses Registered (Course Code, Title, No. of Credits, Grade Earned etc.), Credits earned, SGPA, and CGPA.

13.0. Declaration of Results

13.1 Computation of SGPA and CGPA are done using the procedure listed in 11.5 – 11.9.

13.2. For Final % of Marks equivalent to the computed final CGPA, the following formula may be used …

% of Marks = (final CGPA – 0.5) x 10

14.0. Award of Degree

14.1 A Student who registers for all the specified Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes all the examinations prescribed in the entire UG E&T Programme (UG PROGRAMME), and secures the required number of 160 Credits (with CGPA ≥ 5.0), within 8 Academic Years from the Date of Commencement of the First Academic Year, shall be declared to have 'QUALIFIED' for the Award of the B.Tech. Degree in the chosen Branch of Engineering as selected at the time of Admission.

14.2. A Student who qualifies for the Award of the Degree as listed in Item 14.1, shall be placed in the following Classes …

(a) Students with final CGPA (at the end of the UG PROGRAMME) ≥ 8.00, and fulfilling the following conditions -

(i) Should have passed all the Courses in 'FIRST APPEARANCE' within the first 4 Academic Years (or 8 Sequential Semesters) from the Date of Commencement of his First Academic Year,

(ii) Should have secured a CGPA ≥ 8.00, at the end of each of the 8 Sequential Semesters, starting from the I Year I Semester onwards,

(iii) Should not have been detained or prevented from writing the End Semester Examinations in any Semester due to shortage of attendance or any other reason, shall be placed in '**FIRST CLASS with DISTINCTION'**.

(b) Students having final CGPA (at the end of UG PROGRAMME) ≥ 8.00 , but not fulfilling the above conditions shall be placed in 'FIRST CLASS'.

(c)Students with final CGPA (at the end of the UG PROGRAMME) ≥ 6.50 but < 8.00, shall be placed in 'FIRST CLASS'.

(d) Students with final CGPA (at the end of the UG PROGRAMME) ≥ 5.50 but < 6.50, shall be placed in 'SECOND CLASS'.

(e) All other Students who qualify for the Award of the Degree (as per Item 14.1), with final CGPA (at the end of the UG PROGRAMME) ≥ 5.00 but < 5.50, shall be placed in 'PASS CLASS'.

14.3. A student with final CGPA (at the end of the UG PROGRAMME) < 5.00 will not be eligible for the Award of the Degree.

14.4. Students fulfilling the conditions listed under Item 14.2(a) alone will be eligible candidates for - 'College Rank' and 'Gold Medal' considerations.

15.0. Withholding of Results

15.1 If the student has not paid fees to College at any stage, or has pending dues against his name due to any reason whatsoever, or if any case of indiscipline is pending against him, the result of the student may be withheld, and he will not be allowed to go into the next higher Semester. The Award or issue of the Degree may also be withheld in such cases.

16.0 Transitory Regulations

16.1 **For Students detained due to shortage of attendance and credits**

i) The Student who has not registered in a particular semester for any reason, or has been detained for want of attendance may be considered eligible for readmission to the same semester in the next Academic Year or subsequent academic years. The student who has been detained for lack of credits can be readmitted to the next Academic Year only on obtaining minimum required credits.

ii) A Student who has been detained in I year I Semester of R14/R15 Regulations due to lack of attendance shall be permitted to join I year I Semester of R18 Regulations and is required to complete the study of B.Tech. programme within the stipulated period of eight academic years from the date of first admission in I Year.

iii) A student who has been detained in II semester of I Year or any semester of II, III and IV years of R14/R15 regulations for want of attendance shall be permitted to join the corresponding semester of R18 regulations and is required to complete the study of B.Tech within the stipulated period of eight academic years from the date of first admission in I Year. The R18 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester.

iv) A student of R14/R15 Regulations who has been detained due to lack of credits shall be promoted to the next Academic Year of R18 Regulations only after acquiring the required credits as per the corresponding regulations of his/her first admission. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission.

v) After re-admission the student is required to study the course as prescribed in the new regulations for the re-admitted programme at that level and thereafter.

vi) A student who has failed in any course(s) under any regulation has to pass those course(s) in the same regulations.

vii) In case the course(s) offered in subsequent semesters are repetitive, substitute courses identified by the BOS for replacement of completed courses by the students will be given. The students will be suggested to register the said substitute course(s) in the new regulation. One Internal examination for the substitute course(s) may be conducted before commencement of end semester examinations.

viii) The marks/credits/SGPA are transferred and converted (as per applicable regulations) for all subjects of old regulation if necessary and treated as successfully cleared in the new prescribed program course structure.

ix) For readmitted students the courses studied and cleared in earlier Regulation and not offered those courses in new applicable Regulation are not considered for SGPA & CGPA calculation when secured credits are greater than maximum credits for the award of degree.

x) The decision of BOS is final in case of any ambiguity in identifying the equivalent/substitute courses

xi) The decision of Academic council is final in case of any ambiguity in transitory regulations

16.2. **For Transferred Students**

i) The students seeking transfer to CMRCET from various other Universities/Institutions have to pass the failed course(s) which are equivalent to the course(s) of CMRCET, and also have to pass the course(s) of CMRCET which the students have not studied at the earlier institution. Further the students have passed some of the course(s) at the earlier institutions, and if the same course(s) are prescribed in different semesters of CMRCET and repeated, then substitute courses (with equal credits) identified by BOS may be given to the students

ii) For not cleared course(s) in the previous Institute, equivalent course(s) will be identified by the BOS for pursuing the same. The students will be suggested to pursue the course and to register the said equivalent course(s) in the new regulation and to qualify in examinations.

iii) Marks/Grades/Credits obtained in the courses completed in previous Institution are to be converted in to equivalent Grades/Credits/SGPA/CGPA as per CMRCET regulations.

iv) One Internal examination for the course(s) not studied in previous institution and taken as additional/substitute courses in CMRCET may be conducted before commencement of end semester examinations.

v) If necessary the student may be given additional course(s) in place of the course(s) studied in earlier Institution which are not part of CMRCET regulation to balance and meet the credit requirement for the award of degree as per applicable regulation

vi) The students who seek transfer to CMRCET from various other Universities/Institutions, and satisfy credits requirement as per earlier institution but not satisfy the credit requirements as per CMRCET after finalizing equivalent course(s), may be permitted to continue the programme. However such a student has to meet the requirement of credits for promotion to the next year as per CMRCET applicable regulations.

vii) For transferred students the courses studied and cleared in earlier Institution and not offered those courses in CMRCET are not considered for SGPA & CGPA calculation when secured credits are greater than maximum credits for the award of degree.

viii) In case of any ambiguity in identifying the equivalent/substitute courses, the decision of BOS is final.

ix) The decision of Academic council is final in case of any ambiguity in transitory regulations

17.0 Student Transfers

17.1 There shall be no Branch transfers after the completion of Admission Process.

17.2 Transfer of candidates from other Institutions will be governed by the regulations of Telangana State Government issued from time to time.

18.0 Scope

i) Where the words “he”, “him”, “his”, occur in the write-up of regulations, they include “she”, “her”, “hers”.

ii) Where the words “Subject” or “Subjects”, occur in these regulations, they also imply “Course” or “Courses”.

iii) The Academic Regulations should be read as a whole, for the purpose of any interpretation.

iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor/ Principal is final.

v) The College may change or amend the Academic Regulations, Course Structure or Syllabi at any time, and the changes or amendments made shall be applicable to all Students with effect from the dates notified by the College Authorities.

ACADEMIC REGULATIONS FOR B.TECH. (LATERAL ENTRY SCHEME)

(Applicable for the students admitted into II Year B.Tech. (Lateral Entry Scheme) from the Academic Year 2019-20 and onwards)

1. **Eligibility for award of B. Tech. Degree (LES)**

1.1. The LES candidates shall pursue a course of study for not less than three academic years and not more than six academic years.

1.2. The candidate shall register for 122 credits and secure 122 credits from II to IV Year B.Tech. Program (LES) for the award of B.Tech. Degree. They are exempted from the courses of I year offered to regular entry students.

1.3. The students, who fail to fulfill the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall for feittheirseats.

1.4. The attendance regulations of B.Tech.(Regular) shall be applicable to B.Tech. (LES).

2. **Promotion Rule**

A student shall be eligible for promotion in B.Tech programme, if he/she acquires the minimum number of credits as given below:

2.1. A student shall be promoted from II Year to III Year only if he/she fulfills the academic requirements of 24 credits out of 41 credits (60% of average credits) up to II Year II Semester, from all the examinations, whether or not the candidate takes the examinations.

2.2. A student shall be promoted from III year to IV year only if he/she fulfills the academic requirements of 49 credits out of 83 credits (60%ofaveragecredits) up to III Year II Semester from all the examinations, whetheror not the candidate takes the examinations.

2.3. A student shall register and put up minimum attendance in all 122 credits and earn all 122 credits to be eligible for the award of degree.

2.4. Students who fail to earn 122 credits as indicated in the course structure with in six academic years from the year of their admission shall forfeit their seat in B.Tech. Course and their admission stands cancelled.

3. **Award of Class**

All the other regulations as applicable to B.Tech.4-year degree course (Regular) will hold good for B.Tech. (Lateral Entry Scheme).

MALPRACTICE RULES

Disciplinary Action for Malpractices/Improper Conduct in Examinations

	Nature of Malpractices/ Improper conduct	**Punishment**
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed

	communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate Who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the Remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end semester examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police

		and a case is registered against him.
4.	Smuggles the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all end semester Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks	Cancellation of the performance in that subject
6.	Refuses to obey the orders of the Chief Superintendent/Assistant–Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the or organizes a walk out or instigates others **to** examination hallwalk out, or threatens the officer- in-charge or any person on duty in or outside the examination hall of any injury**,** to his person or to any of his relations whether	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates are also debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	by words, either spoken or written or by signs or by visible representation, assaults the officer- in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the	Expulsion from the examination hall and cancellation of the

	examination hall.	performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of That semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	If the student belongs to the college, expulsion from the examination performance in that subject and all other subjects shall and cancellation of the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for other remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year.

12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the College Academic Committee for further action to award suitable punishment.	

Malpractices identified by squad or special invigilators

Punishments to the candidates as per the above guidelines.

Malpractice identified at Spot center during valuation

1) The following procedure is to be followed in the case of malpractice cases detected during valuation, scrutiny etc. at spot center. Malpractice is detected at the spot valuation. The case is to be referred to the malpractice committee. Malpractice committee will meet and discuss/question the candidate and based on the evidences, the committee will recommend suitable action on the candidate.
2) A notice is to be served to the candidate(s) involved through the Principal to his address and to the candidate(s) permanent address regarding the malpractice and seek explanations.
3) The involvement of staff who are in charge of conducting examinations, invigilators valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing in correct or misleading information) that infringe upon the course of natural justice to one and all concerned at the examinations shall be viewed seriously and recommended for award of appropriate punishment after thorough enquire.
4) Based on the explanation and recommendation of the committee action may be initiated.

5) **Malpractice committee:**

(a)	Controller of Examinations	Chairman
(b)	Assistant Controller of Evaluation	Member
(c)	Chief Examiner of the Course/ Subject Expert	Member
(d)	Concerned Head of the Department	Member
(e)	Concerned Invigilator	Member

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)

DEPARTMENT OF ECE

Institute Vision

To be a premier academic institution striving continuously for excellence in technical education, research and technological service to the nation.

Institute Mission

- Create and sustain a community of learning in which students acquire knowledge and learn to apply it professionally with a concern for the society.
- Pursue and disseminate research findings and offer knowledge based technological services to satisfy the needs of society and the industry.
- Promote professional ethics, leadership qualities and socialresponsibilities.

Vision of the Department

- To produce globally competitive engineering graduates with social awareness and become centre of excellence through research in the areas of Electronics & Communication Engineering.

Mission of the Department

- To impart quality education to the students through quality faculty in the domain of Electronics & Communication Engineering and related fields to make them globally competitive in employment and higher education.

- To pursue research in Electronics & Communication Engineering and related disciplines in order to serve the needs of the society.

- Develop self-learning abilities and professional ethics to remain professionally competent so as to serve the society.

Program Educational Objectives (PEOs)

PEO-1: Excel in their professional career and in higher education in Electronics & Communication Engineering and related fields.

PEO-2: Exhibit leadership through professional ability and team work.

PEO-3: Adapt to emerging trends for sustained growth in their relevant areas of interest and exhibit social responsibility

Program Outcomes

PO-1: Ability to apply the knowledge of mathematics, science, engineeringfundamentals for solution of complex engineering problems.

PO-2: Ability to identify, formulate, research literatureand analyze complex engineering problems with appropriate considerations.

PO-3: Ability to design solution for complex engineering problems with appropriate consideration for society.

PO-4: Ability to use research –based knowledge and research methods including design of experiments to provide valid conclusions.

PO-5: Ability to learn and apply appropriate modern tools for engineering solutions.

PO-6: Ability to assess societal, health, safety, legal and cultural issues and theconsequent responsibilities and follow them in professional practice.

PO-7: Ability to understand the impact of the professional practices on environment, society and its sustainable development.

PO-8: Ability to apply ethical principles and commit to professional ethics in engineering practice.

PO-9: Ability to function on an inter- disciplinary team.

PO-10: Ability to communicate effectively.

PO-11: Ability to understand engineering and management principles and apply them to one’s own work, as a member and leader in a team, to manage projects.

PO-12: Ability to engage in lifelong learning.

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY, (AUTONOMOUS)
B.Tech (ECE)
CBCS & OUTCOME BASED COURSE STRUCTURE

SEMESTER - I						
Course Code	Course Title	Category	Hours per Week			
			L	T	P	C
A30001	English	HSMC	2	0	0	2
A30004	Linear Algebra and Calculus	BSC	3	1	0	4
A30011	Engineering Chemistry	BSC	3	0	0	3
A30501	Programming for Problem Solving	ESC	3	0	0	3
A30002	English Language Communication Skills Lab	HSMC	0	0	3	1.5
A30012	Engineering Chemistry Lab	BSC	0	0	3	1.5
A30502	C Programming Lab	ESC	0	0	3	1.5
A30314	Engineering Workshop	ESC	0	0	3	1.5
A30019	Engineering Exploration & Practice	BSC	0	0	3	1.5
	Total:		11	1	15	**19.5**

SEMESTER - II						
Course Code	Course Title	Category	Hours per Week			
			L	T	P	C
A30005	ODEs and Multivariable Calculus	BSC	3	1	0	4
A30009	Applied Physics	BSC	3	1	0	4
A30503	Data Structures & Algorithms	ESC	3	0	0	3
A30313	Engineering Drawing	ESC	1	0	3	2.5
A30023	Applied Physics Lab	BSC	0	0	3	1.5
A30504	Data Structures & Algorithms Lab	ESC	0	0	3	1.5
A30505	Basic Internet of Things Lab	ESC	0	0	2	1
A30020	Introduction to Social Innovation	HSMC	0	0	2	1
	Total:		10	2	13	**18.5**

Total Credits in I Year: 38

SEMESTER – III						
Course Code	Course Title	Category	Hours per Week			
			L	T	P	C
A30006	Numerical Methods & Complex Variables	BSC	3	1	0	4
A30401	Electronic Devices & Circuits	PCC	3	0	0	3
A30224	Electrical Engineering	ESC	3	0	0	3
A30402	Probability & Stochastic Processes	PCC	3	1	0	4
A30403	Switching Theory & Logic Design	PCC	3	0	0	3
A30016	Gender Sensitization	MC	0	0	2	0
A30404	Electronic Devices & Circuits Lab	PCC	0	0	3	1.5
A30225	Electrical Engineering Lab	ESC	0	0	3	1.5
	Total:		15	2	8	**20**
SEMESTER – IV						
Course Code	Course Title	Category	Hours per Week			
			L	T	P	C
A30405	Signals & Systems	PCC	3	0	0	3
A30406	Electronic & Pulse Circuits	PCC	3	0	0	3
A30407	Analog & Digital Communications	PCC	3	1	0	4
A30408	Electromagnetic Waves & Transmission Lines	PCC	3	1	0	4
A30230	Control Engineering	ESC	3	0	0	3
A30021	Social Innovation in Practice	HSMC	0	0	2	1
A30015	Soft Skills & Professional Ethics	MC	0	0	2	0
A30409	Basic Simulation Lab	PCC	0	0	3	1.5
A30410	Electronic & Pulse Circuits Lab	PCC	0	0	3	1.5
	Total:		15	2	10	**21**
Total Credits in II Year: 41						

SEMESTER – V						
Course Code	Course Title	Category	Hours per Week			
			L	T	P	C
A30411	Antennas & Wave Propagation	PCC	3	0	0	3
A30412	Linear & Digital IC Applications	PCC	3	0	0	3
A30413	Digital Signal Processing	PCC	3	0	0	3
A30414	Electronic Measurements & Instrumentation	PCC	3	0	0	3
PE	**Professional Elective-I**	PEC	3	0	0	3
A30441	Digital Design Through Verilog HDL					
A30442	Telecommunications Switching Systems & Networks					
A30457	Computer Organization					
A30017	Indian Constitution	MC	2	0	0	0
A30018	Essence of Indian Traditional Knowledge					
A30560	Introduction to Artificial Intelligence	MC	2	0	0	0
A30022	NCC/NSS	MC	2	0	0	0
A30415	Analog & Digital Communications Lab	PCC	0	0	3	1.5
A30416	Digital Signal Processing Lab	PCC	0	0	3	1.5
A30003	Advanced English Communication Skills Lab	HSMC	0	0	3	1.5
	Total:		19	0	9	**19.5**
A30417	Mini Project-I	MC	**During Summer Vacation/Non Credit**			
A30418	Summer Internship-I					

SEMESTER - VI						
Course Code	Course Title	Category	Hours per Week			
			L	T	P	C
A30419	Microwave Engineering	PCC	3	0	0	3

A30420	VLSI Design	PCC	3	0	0	3
A30421	Microprocessors & Microcontrollers	PCC	3	0	0	3
PE	**Professional Elective-II**	PEC	3	0	0	3
A30443	Digital Image processing					
A30444	Cellular & Mobile Communications					
A30516	Operating Systems					
A30013	Business Management & Financial Analysis	HSMC	4	0	0	4
A30014	Environmental Sciences	MC	2	0	0	0
A30556	Cyber Security	MC	2	0	0	0
A30422	Microprocessors & Microcontrollers Lab	PCC	0	0	3	1.5
A30423	Microwave Engineering Lab	PCC	0	0	3	1.5
A30424	IC Applications & VLSI Lab	PCC	0	0	3	1.5
A30425	Technical Seminar-I	PROJ	2	0	0	2
	Total:		20	0	9	**22.5**
Total Credits in III Year: 42						
SEMESTER – VII						
Course Code	Course Title	Category	Hours per Week			
			L	T	P	C
A30514	Computer Networks	ESC	3	0	0	3
PE	**Professional Elective-III**	PEC	3	0	0	3
A30445	Microwave Antennas					
A30446	Optical Communications					
A30447	Embedded system design					
PE	**Professional Elective-IV**	PEC	3	0	0	3
A30448	CPLD &FPGA Architectures					
A30449	Radar Systems					
A30450	Real Time Operating systems					
PE	**Professional Elective-V**	PEC	3	0	0	3

A30451	Low Power VLSI Design					
A30452	Satellite communication					
A30455	Biomedical Instrumentation					
OE	**Open Elective - I**	OEC	3	0	0	3
OE	**Open Elective - II**	OEC	3	0	0	3
A30428	Major Project Phase-I	PROJ	0	0	6	3
	Total:		18	0	6	**21**
A30426	Mini Project-II	MC	**During Summer Vacation/ Non Credit**			
A30427	Summer Internship-II					

SEMESTER - VIII

Course Code	Course Title	Category	Hours per Week			
			L	**T**	**P**	**C**
PE	**Professional Elective-VI**	PEC	3	0	0	3
A30453	Wireless Communication Networks					
A30454	Digital Signal Processors & Architectures					
A30456	Artificial Nueral Networks					
OE	**Open Elective - III**	OEC	3	0	0	3
OE	**Open Elective - IV**	OEC	3	0	0	3
A30429	Technical Seminar-II	PROJ	2	0	0	2
A30430	Major Project Phase-II	PROJ	0	0	14	7
	Total:		11	0	14	**18**

Total Credits in IV Year: 39

OPEN ELECTIVES		
Sl. No	**SubjectCode**	**Name of the Subject**
1	A30554	Java Programming
2	A30531	Python Programming
3	A30555	Introduction to Database Management Systems
4	A30537	Data Analytics with R
5	A30557	Web Programming
6	A30542	Cloud Computing
7	A30538	Deep Learning
8	A30559	Introduction to Data Science
9	A30471	Principles of Electronic Communications
10	A30472	Basic Electronics Engineering
11	A30473	Image Processing
12	A30474	Digital Electronics
13	A30475	Data Communications
14	A30476	Microcontrollers & Applications
15	A30477	Fundamentals of Embedded Systems
16	A30478	Sensors & Transducers
17	A30383	Fundamentals of Engineering Materials
18	A30377	Basics of Thermodynamics
19	A30357	Fundamentals of Manufacturing Processes
20	A30379	Fundamentals of Automobile Engineering
21	A30382	Fundamentals of Mechanical Engineering
22	A30378	Waste to Energy
23	A30358	Industrial Safety Engineering
24	A30360	Work System Design
25	A30258	Basics of Power Electronics & Drives
26	A30252	Power Generation Systems
27	A30259	Electrical & Hybrid Vehicles
28	A30260	Electrical Safety
29	A30253	Fuel Cell Technology
30	A30255	Energy Efficiency in Electrical Utilities
31	A30256	Energy Audit & Conservation

32	A30257	Nano Technology
33	A30160	Disaster Management and Mitigation
34	A30161	Remote Sensing and GIS
35	A30162	Green Buildings
36	A30163	Air Pollution and Control
37	A30164	Basics of Civil Engineering
38	A30165	Sustainability Concepts in Civil Engineering
39	A30166	Environmental Protection and Management
40	A30167	Alternate Building Materials
41	C30161	Logistics and Supply Chain Management
42	C30162	Knowledge Management
43	C30163	Management of Industrial Relations
44	C30164	Entrepreneurship
45	C30165	Basics of Insurance & Taxation
46	C30166	Business Ethics & Corporate Governance
47	C30167	Marketing Management
48	C30168	Intellectual Property Rights

Note:
The above courses (Open Electives) are exclusively offered to students who have not studied the above courses (OEs) or their advanced courses as part of their Professional Electives or Professional Core Courses.

DETAILED SYLLABUS

I SEMESTER

(A30001) ENGLISH

B. Tech. (ECE) I-Semester

L	T	P	C
2	0	0	2

UNIT-I:
Reading: On the Conduct of Life: William Hazlittfrom "Language and Life:
A Skills Approach" Published by Orient Black Swan, Hyderabad.
Grammar: Prepositions
Vocabulary: Word Formation I: Introduction to Word Formation
Writing: Clauses and Sentences

UNIT-II:
Reading: The Brook: Alfred Tennyson from "Language and Life: A Skills Approach" Published by Orient Black Swan, Hyderabad**.**
Grammar: Articles
Vocabulary: Word Formation II: Root Words from Other Languages
Writing: Punctuation
Life Skills: Self Improvement- 'How I Became a Public Speaker': George Bernard Shah

UNIT-III:
Grammar: Noun-Pronoun Agreement, Subject-Verb Agreement
Vocabulary: Word Formation III: Prefixes and Suffixes from Other Languages
Writing: Principles of Good Writing
Life Skills: Time Management- 'On Saving Time': *Seneca*

UNIT-IV:
Grammar: Misplaced Modifiers
Vocabulary: Synonyms and Antonyms
Writing: Essay Writing
Life Skills: Innovation- Muhammad Yunus – A biography

UNIT –V:
Reading: Politics and English Language: George Orwell from "Language and Life: A Skills Approach" Published by Orient Black Swan, Hyderabad.
Grammar: Clichés, Redundancies
Vocabulary: Common Abbreviations
Writing: Writing a Summary

TEXTBOOKS:

1. A Text book entitled **"Language and Life: A Skills Approach"** Published by Orient Black Swan, Hyderabad. ISBN:978-93-5287-422-4

REFERENCES:

1. Practical English Usage. Michael Swan. OUP. 1995
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

COURSE OUTCOMES:
At the end of the course the student will be able to:

1. Apply the rules of Noun-Pronoun Agreement, Subject-Verb Agreement in sentence formation.
2. Identify the Root Words from other Languages and describe word formation methods in English.
3. Employ Synonyms, Antonyms, Affixation and Acronyms in writing and speaking correct English
4. Compose essays and summaries in English and apply time management skills to make best use of time.
5. Apply the public speaking skills in giving presentations and speeches in English

(A30004) LINEAR ALGEBRA AND CALCULUS
(Common to all branches**)**

B. Tech. (ECE) I-Semester

L	T	P	C
3	1	0	4

UNIT-I

Matrices: Types of matrices, Symmetric, Hermitian, Skew-symmetric, Skew-Hermitian, Orthogonal matrices, Unitary matrices, Rank of a matrix by echelon form and normal form, Inverse of non-singular matrices by Gauss-Jordan method, System of linear equations - solving system of homogeneous and non-homogeneous equations, Gauss elimination method, Gauss-Seidel iteration method.

UNIT -II

Eigen values and Eigen vectors: Eigen values, Eigen vectors and their properties, Diagonalization of a square matrix, Cayley-Hamilton theorem (without proof) - Inverse and power of a matrix by Cayley-Hamilton theorem, Quadratic forms and nature of the quadratic forms, Reduction of quadratic form to canonical form by linear and orthogonal transformations.

UNIT -III

Sequence: Definition of a sequence, Limit, Convergent, Divergent and oscillatory sequences.

Series: Definition of a series, Convergent, Divergent and Oscillatory Series, Series of positive terms, Comparison test, P-test, D-Alembert's ratio test, Raabe's test, Cauchy's integral test, Cauchy's root test, Logarithmic test. **Alternating series:** Leibnitz test, Alternating convergent series, Absolute and conditionally convergence.

UNIT -IV

Calculus:

Mean value theorems: Rolle's theorem, Lagrange's mean value theorem with their geometrical interpretation and applications, Cauchy's mean value theorem, Taylor's series, Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (only in Cartesian coordinates),

Improper Integral: Beta, Gamma functions and their applications.

UNIT -V

Multivariable calculus (Partial Differentiation and applications): Definitions of Limit and continuity, Partial differentiation, Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

Text Books

1. Higher Engineering Mathematics, (36th Edition), B.S. Grewal, Khanna Publishers, 2010
2. Advanced Engineering Mathematics, (9th Edition), Erwin kreyszig, John Wiley & Sons, 2006.

Reference Books

1. Advanced Engineering Mathematics (3rd edition) by R.K. Jain & S.R.K. Iyengar, Narosa Publishing House, Delhi.
2. Calculus and Analytic geometry, (9th Edition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
3. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2008.
4. Higher Engineering Mathematics, (11th Reprint), Ramana B.V., Tata McGraw Hill New Delhi, 2010.
5. Engineering Mathematics – I, T.K.V. Iyengar, B. Krishna Gandhi & Others, Edition S.Chand 2013 Yr.
6. Applied Mathematics for Engineers & Physicists (3rd edition) by Pipes & Harvill, McGraw Hill Internation Book company.

Course Outcomes

On completion of the course students will be able to

1. Solve linear system represented by matrices
2. Obtain eigen values, eigen vectors and diagonalization of a square matrix.
3. Analyze the nature of sequence and series.
4. Verify mean value theorems & evaluation of improper integrals by using Beta and Gamma functions
5. Find maxima & minima of functions of several variables.

(A30011) ENGINEERING CHEMISTRY

B. Tech. (ECE) I-Semester

L	T	P	C
3	0	0	3

UNIT-I

Molecular Structure and Theories of Bonding

Introduction, Concept of atomic and molecular orbitals, Linear combination of atomic orbitals (LCAO), Molecular orbitals of diatomic molecules, Molecular orbital energy level diagrams of diatomic molecules- N_2, O_2 and F_2,π −molecular orbitals of butadiene and benzene.

Crystal Field Theory (CFT): Salient features of CFT, Crystal field splitting patterns of transition metal ion d-orbitals- tetrahedral, octahedral and square planar complexes.

UNIT-II

Electrochemistry: Introduction**,** Conductance- Specific conductance, Equivalent conductance, Molar conductance and their inter relationship, Numerical problems, Electrochemical cell, Electrode potential, Standard electrode potential and E.M.F of the cell, Nernst equation- derivation and applications, Types of electrodes- Quinhydrone electrode, Calomel electrode and Glass electrode. Electro chemical series and its applications. Concept of concentration cells, Electrolytic concentration cell and numerical problems, Batteries- primary (Lithium cell), secondary (Lead acid storage battery and Lithium ion battery) and Fuel cells (H_2-$O_2$and methanol-oxygen).

Corrosion: Causes and effects of corrosion, Theories of chemical and electrochemical corrosion, Mechanism of electrochemical corrosion, Pilling-Bedworth rule, Types of corrosion- Galvanic, Waterline and Pitting corrosion, Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection, Sacrificial anode and Impressed current cathodic methods, Surface coatings- Metallic coatings, hot dipping, galvanizing and tinning, Electroplating- Copper plating and electroless plating - Nickel plating.

UNIT –III

Spectroscopic Techniques and Applications

Principles of spectroscopy and selection rules, Applications of UV-Visible spectroscopy, Vibrational and rotational spectroscopy (IR spectroscopy)-Applications, Nuclear magnetic resonance-Chemical shift, Splitting pattern and Integration, Introduction to magnetic resonance imaging.

UNIT-IV

Water Technology: Sources of water, Impurities in water, Hardness of water, Temporary and permanent hardness, Units of hardness, Estimation of temporary and permanent hardness of water, EDTA method, Numerical problems, Potable water treatment-Specifications, Steps involved in treatment-Sedimentation, Coagulation, Filtration, Sterilization, Desalination of Brackish Water, Reverse Osmosis and Electro dialysis.

Industrial water treatment, Boiler troubles - Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming and foaming. Hot lime and cold lime soda process-Numerical problems, Zeolite process and Ion exchange process. Internal conditioning methods like Phosphate, Carbonate, Calgon and Colloidal conditioning.

UNIT-V

Stereochemistry: Representations of three dimensional structures, Structural isomers and stereoisomers, Configurations and symmetry, Chirality- Enantiomers, Diastereomers, Optical activity, Absolute configurations and conformational analysis of n-butane.

Organic Reaction Mechanisms and Synthesis of a Drug Molecule: Introduction, Substitution reactions- Nucleophilic substitution reactions (Mechanisms of SN^1 and SN^2 reactions, Addition reactions- Electrophilic and nucleophilic addition reactions, Addition of HBr to propene, Markownikoff and anti markownikoff's additions, Grignard additions on carbonyl compounds, Elimination reactions- Dehydro halogenation of Alkyl halides, Shetzeff rule.

Oxidation reactions- Oxidation of Alcohols using $KMnO_4$ and chromic acid, Reduction reactions-reduction of carbonyl compounds using $LiAlH_4$, $NaBH_4$, Synthesis of a commonly used drug molecules (Paracetamol and Ibuprofen).

Text Books

1. "Engineering Chemistry", P.C Jain and Jain Monika,Dhanpat Rai Publication Company, 16th Edition, 2015.
2. Text Book of Engineering Chemistry by A. Jaya Shree, Wiley India Pvt. Ltd, New Delhi.

Reference Books

1. University chemistry, by B. H. Mahan, Narosa Publication.1998.

2. Chemistry: Principles and Applications, by M. J. Sienko and R.A. Plane, McGraw-Hill, 3rd edition, 1980.
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell, McGraw-Hill, 3rdrevised edition, 1983.
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.Krishnan.
5. Physical Chemistry, by P. W. Atkins, W.H. Freeman and Company, 5th Edition, 1994.
6. "Text Book of Engineering Chemistry", B.Rama Devi, Ch. VenkataRamana Reddy and PrasanthRath, Cengage Learning 2017.
7. "Organic Chemistry", Morison and Boyd, Pearson publications, 7th Edition 2011.
8. Organic Chemistry: Structure and Function by K.P.C.Volhardt and N.E.Schore,5thEdition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

Course Outcomes

After completion of the course students will be able to

1. Explain the benefits of treated water as source in steam generation in industrial applications.
2. Describe how electrochemical concepts can be used in various practical applications, like batteries, fuel cells etc., Explain the chemical applications of electricity.
3. Apply knowledge of corrosion science to problems in materials engineering, Explain various methods of prevention of corrosion of metals.
4. Analyze microscopic chemistry in terms of atomic and molecular orbitals.
5. List major chemical reactions that are used in the synthesis of drugs.

(A30501) PROGRAMMING FOR PROBLEM SOLVING
(Common to all branches)

B. Tech. (ECE) I-Semester

L	T	P	C
3	0	0	3

UNIT –I

Introductory Concepts: Introduction to Computers, Computer Characteristics, Modes of Operation, Types of Programming Languages.

Idea of Algorithm: Steps to solve logical and numerical problems.

Representation of Algorithm: Flowchart/ Pseudo code with examples.

Algorithms to programs: Source code, variables (with data types), variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Introduction to C: Some Simple C Programs, Desirable Program Characteristics.

C Fundamentals: The C Character Set, Identifiers and Keywords, Data Types, Constants Variables and Arrays Declarations, Expressions, Statements, Symbolic Constants.

Preparing and Running a Complete C Program: Planning a C Program, Writing a C Program, Entering the Program into the Computer, Compiling and Executing the Program, Error Diagnostics, Debugging Techniques.

Operators and Expressions: Unary Operators, Arithmetic Operators, Relational and Logical Operators, Bitwise Operators, Conditional Operator, Assignment Operators, Special Operators, Precedence & Associativity of Operators, Evaluation of Expressions.

Data Input and Output: Preliminaries, Single Character Input- The getchar Function, Single Character Output- The putchar Function, Entering Input Data- The scanf Function, More About the scanf Function, Writing Output Data- The printf Function, More About the printf Function, The gets and puts Functions.

UNIT –II

Control Statements: Preliminaries, Branching: The if-else Statements, Looping: The while Statement, the do while Statement, the for Statement, Nested Control Structures, the switch Statement, the break Statement, the continue Statement, the goto Statement.

Arrays: Defining an Array, Processing an Array, Multidimensional Arrays.

UNIT –III

Functions: A Brief Overview, Defining a Function, Accessing a Function, Function Prototypes, Passing Arguments to a Function, Recursion, Passing Arrays to Functions.

Program Structure: Storage Classes- Automatic Variables, External Variables, Static Variables and Register Variables, Multi files Programs, More about Library Functions.

Strings: String Handling Functions, Sample C Programs without using library functions.

UNIT –IV

Pointers: Fundamentals Pointer Declarations, Passing Pointers to Functions, Pointers and One-Dimensional Arrays, Dynamic Memory Allocation, Operations on Pointers, Pointers and Multidimensional Arrays, Arrays of Pointers, Passing Functions to other Functions, More about Pointer Declarations.

Structures and Unions: Defining a Structure, Processing a Structure, User Defined Data Types- typedef & Enumerations, Structures and Pointers, Passing Structures to Functions, Bit fields, Self-Referential Structures and Unions.

UNIT –V

Data Files: Opening and Closing a Data File, Creating a Data File, Processing a Data File, Unformatted Data Files and Command Line Parameters.

Searching and Sorting: Linear and Binary Search, Bubble Sort, Selection Sort and Insertion Sort.

Text Books

1. Byron Gottfried, Schaum's Outline series, "Programming with C", McGraw-Hill.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning,(3rd Edition)

Reference Books

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.

4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.

Course Outcomes

The student shall be able

1. Write algorithms and to draw flowcharts for solving problems.
2. Convert the algorithms/flowcharts to C programs.
3. Code and test a given logic in C programming language.
4. Decompose a problem into functions and to develop modular reusable code.
5. Write C programs using arrays, pointers, strings and structures and perform searching and sorting the data.

(A30002) ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

B. Tech. (ECE) I-Semester

L	T	P	C
0	0	3	1.5

Shall have **two** parts

A. **Computer Assisted Language Learning (CALL) Lab**
B. **Interactive Communication Skills (ICS) Lab**

Introduction
The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

Exercise – I
CALL Lab: Introduction to Phonetics – Speech Sounds – Vowels and Consonants
ICS Lab: Ice-Breaking activity and JAM session

Exercise – II
CALL Lab: Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.
ICS Lab: Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing Others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette.

Exercise – III
CALL Lab: Minimal Pairs- Word accent and Stress Shifts.
ICS Lab: Descriptions – Place, Person, Object

Exercise – IV
CALL Lab: Intonation and Common errors in Pronunciation.
ICS Lab: Extempore- Public Speaking

Exercise – V
CALL Lab: Neutralization of Mother Tongue Influence and Conversation Practice
ICS Lab: Giving Directions

Course Outcomes

At the end of the lab session, the students will be able to

1. Illustrates How to Work in Teams and demonstrates Soft Skills and Communication Skills well.
2. Minimizes the usage of Mother Tongue and Apprises Neutral Accent
3. Prepares for employability skills
4. Speaks English Confidently and does Presentations with self-confidence
5. Distinguishes between Sympathy and Empathy

(A30012) ENGINEERING CHEMISTRY LAB

B. Tech. (ECE) I-Semester

L	T	P	C
0	0	3	1.5

a. Estimation of Hardness of water by EDTA method.
b. Estimation of Alkalinity of water.
c. Estimation of Copper by Colorimetric Method.
d. Conductometric Titration of a strong acid vs a strong base.
e. Conductometric Titration of a weak acid vs a weak base.
f. Potentiometric Titration of a strong acid vs a strong base.
g. Potentiometric Titration of weak acid vs a weak base.
h. Preparation of Paracetmol and Asprin.
i. Determination of Viscosity of a Liquid.
j. Determination of Surface Tension of a liquid.
k. Adsorption of acetic acid on Activated charcoal.
l. Estimation of iodine in table salt.
m. Thin Layer Chromatography (Ortho-Nitro phenol & Para-Nitro phenol).
n. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.

Note: A minimum of 12 experiments listed above to be conducted.

References

1. Engineering Chemistry Lab Manual, Glaze Publishers 2018.
2. Engineering chemistry by B. Rama Devi & Ch. Venkata Ramana Reddy; Cengage Learning, 2012.
3. A Textbook of Engineering Chemistry, Sashi Chawla, Dhanapath Rai & Sons.

Course outcomes

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

1. Predict the extent of hardness range present in water sample and its consequences in industrial operations
2. Prepare drugs like Aspirin and Paracetmol
3. Estimate the strength of solutions, pH of various solutions
4. Evaluate the viscosity and surface tension of liquids
5. Employ the conductometric and potentiometric titrations

(A30502) C PROGRAMMING LAB
(Common to all branches)

B. Tech. (ECE) I-Semester

L	T	P	C
0	0	3	1.5

[Note: The programs may be executed using any available Open Source/ Freely available IDE

Some of the Tools available are:

CodeLite: https://codelite.org/
Code::Blocks: http://www.codeblocks.org/
DevCpp : http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org

This list is not exhaustive and is NOT in any order of preference]

Lab 1: Familiarization with programming environment
Lab 2: Simple computational problems using arithmetic expressions

1. Write a C program to find the roots of a quadratic equation.
2. Write a C program to convert centigrade to Fahrenheit.

Lab 3:

3. Write a C program to find maximum of given three numbers.
4. Write a C program to find the factorial of a positive integer.

Lab 4:

5. Write a C program to determine if the given number is a prime number or not.
6. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to print the Fibonacci sequence up to nth term.

Lab 5:

7. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user using Sieve of Eratosthenes algorithm.
8. Write a C program to convert a positive integer to a roman numeral. Ex. 11 is converted to XI.

Lab 6:

9. Write a C program to print the Pascal triangles pyramid
10. Write a C program to calculate the following series
    i) Sin(x) ii) Cos(x) iii) log(x)

Lab 7 :

11. Write a C program that reads two matrices and uses functions to perform the following:
    i) Addition of two matrices ii) Multiplication of two matrices iii) Transpose of a Matrix

Lab 8:

12. Write a C program to read N students data (Rollno, Name, Marks1, Marks2, Marks3) and find the topper (Use array of structures and implement using functions).

Lab 9:

13. Write a C program that reads 15 names each of up to 30 characters, stores them in an array and use an array of pointers to display them in ascending (ie.alphabetical) order.
14. Two's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.

Lab 10:

15. Write a C program to display the contents of a file to standard output device.
16. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents

Lab 11:

17. Write a C program that uses non-recursive functions to count the number of palindromes in a given string.
18. Write a C program to replace a substring with another in a given line of text.

Lab 12:

19. Write C programs for implementing the following methods
    i) Bubble sort ii) Binary Search

Additional Programs:

20. Write a C program that implements the Insertion sort method to sort a given list of integers in ascending order.
21. Write a C Program to implement selection sort.

22. Write a C program that uses functions to perform the following operations:
    (i) To insert a sub-string into a given main string from a given position.
    (ii) To delete n characters from a given position in a given string.
23. Write a C program to compare two files, printing the first line where they differ.
24. Write a C program to reverse the first n characters in a file. The file name and n are specified on the command line. Use fseek( ) function
25. Write a C program to merge two files into a third file (i.e., the contents of the first file Followed by those of the second are put in the third file)

Reference books

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

Course Outcomes

The student shall be able to

1. To test and execute the programs and correct syntax and logical errors.
2. To implement conditional branching, iteration and recursion.
3. To use arrays and structures to formulate algorithms and programs
4. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
5. Create, read and write to and from simple text and binary files and verifythrough execution.

(A30314) ENGINEERING WORKSHOP
(COMMON TO ALL BRANCHES)

B. Tech. (ECE) I-Semester

L	T	P	C
0	0	3	1.5

I Trade for Exercise:

(Two experiments each from any six trades of the following)

1. Carpentry
2. Fitting
3. Tin-smithy
4. House-wiring
5. Foundry
6. Plumbing
7. Welding
8. Black smithy

II Trades for Demonstration and Exposure:

1. Power tools
2. Machine Tools- Operations on Lathe.

Text Book

1. P Kannaiah and K L Narayana, Workshop Manual, Scitech publishers**,** Second edition.

Course Outcomes

On completion of the course, students will be able to

1. Ability to design and model different prototypes in the carpentry trade such as Cross lap joint, Dove tail joint. and various basic prototypes in the trade of fitting such as Straight fit, V- fit etc.
2. Ability to make various basic prototypes in the trade of Tin smithy such as rectangular tray, and funnel
3. Ability to perform various basic House Wiring techniques such as connecting one lamp with two switch, ceiling fan etc.
4. Ability to design and model various basic prototypes in the trade of Welding such as Lap joint, Butt joint etc
5. Ability to design and model various basic prototypes in the trade of blacksmithy, foundry and plumbing.

(A30019) ENGINEERING EXPLORATION & PRACTICE

B. Tech. (ECE) I-Semester

L	T	P	C
0	0	3	1.5

Module 1: Introduction to Engineering and Engineering Study
Introduction to Engineering and Engineering Study: Difference between science and engineering, scientist and engineer needs and wants, various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer.

Module 2: Engineering Design
Engineering Design Process, Multidisciplinary facet of design, Importance of analysis in engineering design, general analysis procedure, Pair wise comparison chart, Introduction to mechatronics system, generation of multiple solutions, decision matrix, Concepts of reverse engineering

Module 3: Mechanisms
Basic Components of a Mechanism, Degrees of Freedom or Mobility of a Mechanism, 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism.

Module 4: Platform based development
Introduction to various platform based development, programming and its essentials, Introduction to transducers and actuators and its interfacing. Concepts of reverse engineering
Data Acquisition and Analysis: Types of Data, Descriptive Statistics techniques as applicable to different types of data, Types of graphs as applicable to different types of data, Usage of data acquisition tools for descriptive statistics, Data Acquisition, Exporting acquired data to analysis using visual representation

Module 5: Project Management
Introduction, Significance of teamwork, Importance of communication in engineering profession, Project management tools: Checklist, Timeline, Gantt chart, Significance of documentation
Sustainability: Introduction to sustainability, Sustainability leadership, Life cycle assessment, carbon footprint

Reference Books

1. Engineering Fundamentals: An Introduction to Engineering (MindTap Course List) 5th Edition by Saeed Moaveni
2. Software Project Management (SIE), (Fifth Edition); Bob Hughes,MikeCotterell,Rajib Mall; Published by Tata McGraw-Hill Education Pvt. Ltd (2011) ; ISBN 10: 0071072748 ISBN 13: 9780071072748
3. A Ghosh and AK Malik: Theory of Mechanism and Machine; East West Press (Pvt) Ltd., New Delhi.
4. Arduino Cookbook, 2nd Edition by Michael Margolis: O'Reilly Media
5. Data Acquisition and Analysis - Building an Excel Budget Forecast Workbook by Andrew Greaney (Kindle Edition) ISBN: 1521903468
6. Concepts in Engineering Design – 2016; by Sumesh Krishnan (Author), Dr.Mukul Shukla (Author), Publisher : Notion Press.

Course Outcomes

On Completion of the course, the students will be able to

1. Explain the importance of engineering profession in the world.
2. Identify multi-disciplinary approach required in solving an engineering problem
3. "Build a mechanism for a given application"
4. Design a mechatronic system using arduino and electronic components
5. Analyze engineering solution from sustainability perspectives.

II SEMESTER

(A30005) ODEs AND MULTIVARIABLE CALCULUS

(Common to all branches)

B. Tech. (ECE) II-Semester

L	T	P	C
3	1	0	4

UNIT –I

First Order ODE: Exact, Linear and Bernoulli's differential equations, Applications, Newton's law of cooling, Law of natural growth and decay.

Equations not of first degree: Equations solvable for p, Equations solvable for y, Equations solvable for x and Clairaut's type.

UNIT-II

Ordinary Differential Equations of Higher Order: Second and higher order linear differential equations with constant coefficients, Non-Homogeneous terms of the type $e^{ax}, \sin ax, \cos ax,$ polynomials in x, $e^{ax}V(x)$ and $xV(x)$, Method of variation of parameters, Equations reducible to linear ODE with constant coefficients, Legendre's equation, Cauchy-Euler equation.

UNIT-III

Multivariable Calculus (Integration): Evaluation of Double Integrals (Cartesian and polar coordinates), Change of order of integration (only Cartesian form), Evaluation of Triple Integrals, Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals, **Applications:** Areas (by double integrals) and volumes (by double integrals and triple integrals).

UNIT-IV

Vector Differentiation: Vector point functions and scalar point functions, Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT-V

Vector Integration: Line, Surface and volume Integrals. Theorems of Green's, Gauss and Stoke's (without proofs) and their applications.

Text Books

1. Higher Engineering Mathematics, (36^{th} Edition), B.S. Grewal, Khanna Publishers, 2010
2. Advanced Engineering Mathematics, (9^{th} Edition), Erwin kreyszig, John Wiley & Sons, 2006.

Reference Books

1. Advanced Engineering Mathematics (3rd edition) by R.K. Jain & S.R.K. Iyengar, Narosa Publishing House, Delhi.
2. Differential Equations with Applications & Historical Notes (2^{nd}Edi) by George F Simmons, Tata Mc. graw Hill Publishing Co Ltd.
3. Advanced Engineering Mathematics(8^{th}Edition) by Kreyszig, John Wiley & Sons Publishers
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry(9^{th}Edition), Pearson, Reprint, 2002
5. Mathematics for Engineering and Scientists (6^{th} Edi), by. Alan Jeffrey, 2013, Chapman & Hall / CRC
6. Engineering Mathematics – I by T.K.V. Iyengar, B. Krishna Gandhi & Others, 2012 Yr. Edition S.Chand.
7. Differential Equations (3rd Ed), S. L. Ross Wiley India, 1984.

Course Outcomes

On completion of the course students will be able to

1. Determine first order differential equations and obtain solutions.
2. Solve higher order linear differential equations using various methods.
3. Evaluate areas and volumes using multiple integrals
4. Evaluate Gradient, Divergence, Curl and directional derivatives.
5. Evaluate integrals by converting line to surface integral and surface to volume integrals.

(A30009) APPLIED PHYSICS
(Common for ECE, EEE and CSE)

B. Tech. (ECE) II-Semester

L	T	P	C
3	1	0	4

UNIT-I

Principles of Quantum and Statistical Mechanics: Waves and particles, de-Broglie hypothesis-Matter waves, Davisson and Germer's Experiment, Heisenberg's Uncertainty principle, Physical significance of the wave function- (qualitative treatment) Schrödinger's time dependent and time independent wave equations, Particle in a one dimensional potential box- equations for energy and wave function, Concept of electron gas, Maxwell-Boltzmann, Bose –Einstein and Fermi–Dirac statistics (qualitative treatment). Density of energy states, Estimation of Fermi energy.

UNIT-II

Semiconductor Physics: Classification of materials into Conductors, Semiconductors & Insulators. Intrinsic semiconductors-Concentration of electrons in the conduction band &concentration of holes in the valance band, Fermi level in intrinsic semiconductors, Law of mass action, Extrinsic semiconductors, N-Type semiconductor, Carrier concentration in N-Type semiconductors, P-Type semiconductors, Carrier concentration in P-Type semiconductors, drift and diffusion current, Hall effect.

UNIT-III

Physics of Semiconductor Devices: Formation of PN junction, Open circuit PN junction, Energy diagram of PN diode, I-V Characteristics of PN junction diode, Zener diode –breakdown mechanism and characteristics.

Radiative and Non-Radiative recombination, LED, Photo diode & Solar cell-working principle & Applications, Semiconductor photo detectors-PIN and Avalanche structure and their characteristics.

UNIT-IV

Lasers: Characteristics of lasers, Absorption, spontaneous and stimulated emission of radiation, Einstein's coefficients and relation between them, Population inversion, Lasing action, Ruby laser, Helium-Neon laser, Semiconductor diode laser, Applications of lasers.

Fiber Optics: Principle of Optical fiber, Construction of optical fiber, acceptance angle and acceptance cone, Numerical Aperture, Types of optical fibers: Single and Multimode fibers, Step Index optical fibers & Pulse dispersion (qualitative treatment) - Graded index optical fibers & Pulse dispersion (qualitative treatment), Attenuation in optical fibers, optical fiber communication, optical fiber sensors.

UNIT-V

Dielectric Properties: Electric dipole, Dipole moment, Relative permittivity, Polarization and polarizability, Electric susceptibility, Displacement vector, Electronic and Ionic polarization, Orientation polarization (qualitative treatment), Internal fields in solids, Clausius–Mossottiequation, Piezo electric and Pyro-electric materials, Ferro electric materials.

Magnetic Properties: Permeability, Field intensity, Magnetic field induction, Magnetization, Magnetic Permeability & Susceptibility, Classification of Dia, Para, Ferro, Ferri and Anti-Ferro magnetic materials on the basis of magnetic moment (qualitative treatment), Explanation of Hysteresis curve on the basis of Domain theory of Ferro magnetism.

Superconductivity: Introduction, Critical field, Meissner effect, Effect of Magnetic field, Type-I and Type-II Superconductors, Cooper pair, BCS Theory of superconductivity (Qualitative treatment), Applications of Superconductors

Text Books

1. Engineering Physics by B.K. Pandey, S. Chaturvedi- Cengage Learning India Pvt. Ltd., 1stEdition, 2012.
2. Engineering Physics by PK Palanisamy, SciTech Publications, 3rd edition, 2015.

References

1. Fundamentals of Physics by Halliday, R.Resnick and J.Walker,John Wiley and Sons, 6th edition, 2001.
2. Introduction to Quantum Physics by Eisberg and Resnick, John Wiley & Sons, 2nd edition, 1985.
3. Quantum mechanics by D.J Griffiths, Cambridge University press, 2nd edition, 2017.
4. Principles of Lasers by O.Svelto, Plenum publishing Corporation, 4th edition, 1998.
5. Physics of Semiconductor devices by Simon.M Sze and Kwok K. Ng, Wiley Student Edition, 3rd edition, 2006.

Course Outcomes

On completion of the course students will be able to

1. Explain the basic concepts of quantum & statistical mechanics.
2. Describe the classification of solids and the properties of semiconductors. for device designing.
3. Understand the different semiconductor devices and circuits for optical communication
4. Interpret the basic properties of lasers and characteristics of optical fibers for modern communication
5. Aquaire knowledge on properties of dieectric, magnetic materials & illustrate the basic principles of superconductivity.

(A30503) DATA STRUCTURES & ALGORITHMS
(Common to ECE, CSE and EEE)

B. Tech. (ECE) II-Semester

L	T	P	C
3	0	0	3

UNIT-I

Data Structures: Introduction, classification of Data structures, ADT and applications, over view of List and its operations.

Linked Lists: Representation in memory, Operations of Singly Linked List: Traversing, Searching, Insertion, Deletion and Reverse, Doubly Linked List and its Operations, Circular Linked Lists and its Operations.

UNIT-II

Stacks: Stack ADT and its implementations, Applications of Stacks: Infix to Postfix Conversion and Postfix evaluation – Corresponding algorithms.

Queues: Queue ADT and its implementations, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues- Corresponding Algorithms.

UNIT-III

Trees: Basic Tree Terminologies, Representations, types of Binary Trees: Threaded Binary Tree, Binary Search Tree, AVL Tree and their operations: Insertion Deletion, Traversal.

UNIT-IV

Graphs: Basic Terminologies, Representations, Graph traversal algorithms.

Dictionaries: Dictionary as a linear list and its operations-Insertion, Deletion, Searching, Hash tables, Hash Functions, Collision Resolution Techniques-Linear Probing, Quadratic Probing, and Double Hashing.

UNIT-V

Sorting: Quick Sort, Merge Sort, Heap Sort, comparison of techniques.

Pattern Matching Algorithms: Brute-Force Algorithm and Knuth-Morris-Pratt Algorithm.

Text books

1. Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structures in C, Second Edition Universities Press.

2. Thomas H. Cormen Charles E. Leiserson, Introduction to Algorithms, PHI Learning Pvt. Ltd. Third edition.

Reference books

1. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
2. E.Balagurusamy Data Structures Using C, McGraw Hill Education; First edition

Course Outcomes

On completion of the course students will be able to

1. Use data structure concepts for realistic problems.
2. Identify appropriate data structure for solving computing problems in respective language.
3. Develop algorithms, operations on queues, stacks and Linked Lists.
4. Demonstrate the representation and traversal techniques of graphs and their applications.
5. Implement basic operations on binary trees.

(A30313) ENGINEERING DRAWING

B. Tech. (ECE) II-Semester

L	T	P	C
1	0	3	2.5

UNIT-I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance; Conic Sections (Using eccentricity method only) Cycloid, Epicycloids and Hypocycloid.

UNIT-II

Orthographic Projections: Principles of Orthographic Projections – Conventions – Projections of Points and Lines (Excluding traces of lines) Projections of Plane regular geometric figures.—(Excluding Auxiliary Planes and traces of planes)

UNIT-III

Projections of Solids: Projection of regular solids- cube, Cylinder, prisms, pyramids, cone (Excluding Auxiliary Planes).

UNIT-IV

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Solids and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts and combinations

UNIT-V

Transformation of Projections: Conversion of Isometric Views to Orthographic Views and Vice-versa.

Text Books

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication

Reference Books

1. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education

Course Outcomes

On completion of the course students will be able to:

1. "Visualize Conic profiles in buildings, bridges & Visualize cycloidal and involute profiles in
2. developing new products like gears and other Engineering applications"
3. Analyze and draw the projections of points, lines, planes Understand the projection concepts in solids and apply the concepts in the areas of design.
4. "Visualize the components by isometric projection "
5. Represent 3 D objects in pictorial form and convert back to/ from orthographic views.

(A30023) APPLIED PHYSICS LAB
(Common for EEE, ECE and CSE)

B. Tech. (ECE) II-Semester

L	T	P	C
0	0	3	1.5

(Any 8 experiments are to be performed)

1. Energy gap of P-N junction diode: To determine the energy gap of a semiconductor diode.
2. Solar Cell: To study the V-I Characteristics of solar cell.
3. Light emitting diode: Plot V-I and P-I characteristics of light emitting diode.
4. Stewart – Gee's experiment: Determination of magnetic field along the axis of a current carrying coil.
5. Hall effect: To determine Hall co-efficient of a given semiconductor.
6. Photoelectric effect: To determine work function of a given material.
7. LASER: To study the characteristics of LASER sources.
8. Optical fibre: To determine the Numerical aperture of a given fibre and bending losses of Optical fibres.
9. LCR Circuit: To determine the Quality factor of LCR Circuit.
10. Diffraction grating: Determination of wavelength of a source (LASER).
11. Determination of Planck's constant using LED.
12. R-C Circuit: To determine the time constant of R-C circuit.

Laboratory Manual:

1. Laboratory Manual of Engineering Physics by Dr.Y.Aparna&Dr. K. Venkateswara Rao (V.G.S Publishers).
2. Laboratory Manual of Engineering physics, Published by CMR College of Engineering & Technology

Course Outcomes

On completion of the course students will be able to

1. Explain the concept of oscillations and resonance.
2. Determine energy gap of a semiconductor diode and identify the semiconductor by using Hall Effect.
3. Determine the variation of magnetic fields and current variations using Stewarts & Gees Experiment.
4. Design new experiments in engineering for identifying plancks constant and study the characteristics of other optoelectronic devices.
5. Evaluate the basic properties of lasers and optical fibers.

(A30504) DATA STRUCTURES & ALGORITHMS LAB
(Common to ECE, CSE and EEE)

B. Tech. (ECE) II-Semester

L	T	P	C
0	0	3	1.5

Lab 1:

1. Write a C program to perform the following operations on the given array
   (i) Insert element in specific position in to array
   (ii) Delete random element from array
   (iii) Reverse the array elements

Lab 2:

2. Write a C program to implement Single linked list
   i) Insertion ii) Deletion iii) Display.

Lab 3:

3. Write C programs to implement Stack ADT using
   i) Array ii) Linked List

Lab 4:

4. Write a C program that uses stack operations to convert a given infix expression in to its postfix equivalent. (Display the role of stack).
5. Write a C program for Evaluation of postfix expression.

Lab 5:

6. Write C programs to implement Queue ADT using
   i) Array ii) Linked List

Lab 6:

7. Write a C program to implement Binary search tree.
   i) Insertion ii) deletion iii) Traversals

Lab 7:

8. Write a C program to implement binary search tree Non -recursively traversals
   i) Pre- Order ii) Post –Order iii) In-Order

Lab 8:

9. (a) Write a C Program to Check if a Given Binary Tree is an AVL Tree or Not
   (b) Write a C program to find height of a Binary tree
   (c) Write a C program to count the number of leaf nodes in a tree.

Lab 9:

10. Write a C program for implementing Graph traversal
    i) DFS ii) BFS

Lab 10:

11. Write a C program to implement the following collision resolving
    i) Quadratic probing. ii) Linear Probing

Lab 11:

12. Write C programs for implementing the following Sorting methods and display the important steps.
    i) Quick Sort ii) Heap sort

Lab 12:

13. Write a C program for implementing pattern matching algorithms
    i) Knuth-Morris-Pratt ii) Brute Force

Additional

14. Write a C program to implement Double linked list
    i) Creation ii) insertion iii)Deletion. iv)Display
15. write a C program to implement circular queue using sequential list
16. Implement the priority queue using Heap.
17. Write a C Program to Implement Merge sort
18. Write a C program to implement AVL tree.
    i) Creation ii) Deletion iii) Traversals
19. Write a function to reverse the nodes of a linked list
20. Write a C program to implement 2-3-4 tree operations
21. Write a C program to implement B tree operations
22. Write a C program to implement B+ tree operations

Reference Books

1. Ellis Horowitz, Sartaj Sahni, Fundamentals of Data Structures in C, Second Edition Universities Press.
2. Thomas H. Cormen Charles E. Leiserson, Introduction to Algorithms, PHI Learning Pvt. Ltd. Third edition.
3. Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company
4. E.Balagurusamy Data Structures Using C, McGraw Hill Education; First edition

Course Outcomes

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

1. Write and execute C-programs to implement Linked List Data Structures.
2. Evaluate postfix expressions by implementing in C-language.
3. Implement Non- linear Data Structures in C-language.
4. Implement various sorting techniques in C-language.
5. Test various pattern matching algorithms by implementing in Clanguage.

(A30505) BASIC INTERNET OF THINGS LAB
(Common to all branches)

B. Tech. (ECE) II-Semester

L	T	P	C
0	0	2	1

Lab Requirements:

Raspberry Pi3 single board Computer, Android SDK, Eclipse IDE, JDK1.8.

Week 1: Introduction to IoT

- Definition of IoT
- History of IoT
- IoT Architecture
- Enabling Technologies for IoT
- Fundamental characteristics of IoT
- Benefits and Applications of IoT
- Introduction to Basic Components

Basic Components				
Jumper wires	LEDs (Light Emitting Diodes)	Resistors	Potentiometer	Diode,
Photo resistor	Buzzer	Temperature Sensor	DC Motor	Push Button
RC Servo	Relays	Breadboard		

Week 2: Programming in python

- Introduction to Python
- Python Installation
- Understanding Python Basics
- Using Arithmetic in your programs
- Learning about Loops

Week 3: Platform Based Development – Raspberry Pi

Introduction to Raspberry Pi

- Why Raspberry Pi?
- Setting up the Raspberry Pi
- Python on Raspberry Pi

Week 4: Basic Experiments Level-1

Demonstration of the following Experiments

Experiment 1: Your First Circuit – To Blink an LED (Light Emitting Diode)

Experiment 2: To Blink an RGB LED

Additional Experiments (optional)

Experiment 1: To read the temperature and display the same in serial monitor.

(use LM35 Temperature sensor)

Experiment 2: To make an LED glow when controller detects a button pressed.

Week 5: Basic Experiments Level -2

Demonstration of the following Experiment

Experiment 1: To control an LED according to the range of analog input sensed using photo resistor. (use Light DependantResistor (LDR))

Additional Experiments (optional)

Experiment 1: To interface the Liquid Crystal Display (LCD) with the Raspberry Pi3 to display the characters on the LCD.

Week 6: Basic Experiments Level -3

Demonstration of the following Experiment

Experiment1: To interface the Ultrasonic Sensor with the Raspberry Pi3 to determine the distance of an object from the sensor.

Additional Experiments (optional)

Experiment1: To interface the Infrared sensor with the Raspberry Pi3 to sense the path is clear/indicate the presence of any obstacles.

Week 7: Introduction to Android

- Introduction to Android
- Explain the structure of Android App.

Experiment 1: Create Hello World application with Android.

Week 8

Experiment 1: Create Application to change the Background Color and Background Image

Experiment 2: Explain simple User interface components in Android and create simple Application

Week 9

Experiment 1: Create an application that display color or image as background when selected the radio buttons or checkboxes

Experiment 2: Create an Application to perform addition, Subtraction, multiplication, division.

Week 10

Explain what is activity, intent and its functions.

Experiment 1: Create an application with Android intent.

Week 11

Experiment 1: Create a simple android application with the following event handlers.

a) On Click
b) On Key Down
c) On Focus changed

Week 12

Experiment 1: Explain about Toast, Create Application with User defined Toast Notifications.

Additional Experiment: Create login page by using login activity

Reference Books:

1. ArshdeepBahga, VijayMadisetti, Internet of Things: A Hands-On Approach, Orient Blackswan Private Limited - New Delhi; First edition (2015)
2. John Horton, Android Programming for Beginners, PACKT publications.

Course Outcomes

At the end of the course the student will be able to:

1. Identify and differentiate various components used in IoT Architecture.
2. Write & execute programs in python programming language.
3. Use Python programming language to interface with Raspberry.
4. Demonstrate the various real time applications using Raspberry Pi.
5. Create and Deploy Mobile applications using Android.

(A30020) INTRODUCTION TO SOCIAL INNOVATION
(Common for all branches)

B. Tech. (ECE) II-Semester

L	T	P	C
0	0	2	1

UNIT-I

Community Study: Types and features of communities**-** Rural, Suburban, Urban and regional, Service based learning, Aims of community based projects, Community visits.

UNIT-II

Social Innovation across Four Sectors: The four sectors – the non-profit sector, public sector, the private sector, the informal sector, links between and cross sectors.

UNIT-III

Stages of Social Innovation: Social organizations and enterprises, social movements, politics and government, markets, academia, philanthropy, social software and open source methods, common patterns of success and failure.

UNIT-IV

Engineering Ethics: Introduction to ethics, moral values, significance of professional ethics, code of conduct for engineers, identify ethical dilemmas in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas.

UNIT-V

Concepts of Indian Patent Act: Steps forPatent filing and Startups, poster presentation.

References:

1. Social Entrepreneurship for the 21st Century: Innovation Across the Non Profit, Private and Public Sectors; Georgia Levenson Keohane; Tata McGraw Hill
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, YeheskelHasenfeld; Palgrave Macmillan
3. Engineering Ethics: An Industrial Perspective; Gail Baura; Elsevier
4. Intellectual Property and Financing Strategies for Technology Startups; Gerald B. Halt, Jr., John C. Donch, Jr., Amber R. Stiles, Robert Fesnak; Springer

5. Fundamentals of Intellectual Property (English) 1st Edition (Paperback, Dr. Kalyan C. Kankanala) Publisher: Asia Law House ISBN: 9789381849514, 938184951X Edition: 1st Edition, 2012.
6. Indian Patent Law (English, Paperback, Kalyan C. Kankanala) Publisher: Oxford University Press- New Delhi, ISBN: 9780198089605, 0198089600 Edition: 2012.

Course Outcomes

On Completion of the course, the students will be able to

1. Identify community issues through community Intearction
2. Illustrate the factors affecting social innovation in various sectors
3. Analyze the stages of scoial innovation for a community problem
4. Adopt the ethical values in implementing the Social innovation
5. Describe the process of property rights and patent filing.

III SEMESTER

(A30006) NUMERICAL METHODS & COMPLEX VARIABLES
(Common for ECE and EEE)

B. Tech. (ECE) III-Semester

L	T	P	C
3	1	0	4

UNIT-I

Laplace Transforms: Laplace transform of standard functions, First shifting theorem, Laplace transforms of functions when they are multiplied and divided by ‘t’. Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transforms of special functions, Laplace transform of periodic functions. Inverse Laplace transform by different methods, Convolution theorem (without Proof), Solving ODEs by Laplace transform method.

UNIT-II

Numerical Methods-I

Solution of polynomial and transcendental equations: Bisection method, Iteration method, Newton-Raphson method and Regula-False method.

Interpolation: Finite differences, Forward differences, Backward differences, Central differences, Symbolic relations and separation of symbols, Interpolation using Newton’s forward and backward difference formulae. Central difference interpolation, Gauss’s forward and backward formulae, Lagrange’s method of interpolation.

UNIT-III

Numerical Methods-II

Numerical integration: Trapezoidal rule, Simpson’s 1/3rd and 3/8 rules.

Numerical Solutions of Ordinary Differential Equations -Taylor’s series, Picard’s method, Euler and modified Euler’s methods, Runge-Kutta method of fourth order.

UNIT–IV

Complex Variables (Differentiation): Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne-Thomson’s methods, Analytic function, Harmonic function, Finding harmonic conjugate, Elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

UNIT –V

Complex Variables (Integration): Line integrals, Cauchy's theorem, Cauchy's Integral formula, Liouville's theorem, Maximum-Modulus theorem (All theorems without proof), Zeros of analytic functions, singularities.

Complex Power series: Taylor's series, Laurent's series, Residues, Cauchy Residue theorem (without proof)

Text books

1. Higher Engineering Mathematics, (36th Edition), B.S. Grewal, Khanna Publishers, 2010
2. Advanced Engineering Mathematics (3rd edition) by R.K. Jain & S.R.K. Iyengar, Narosa Publishing House, Delhi.

Reference Books

1. Introductory methods of Numerical Analysis (4th Edition), S.S. Sastry, PHI, 2005.
2. Complex Variables and Applications (7th Edition), J. W. Brown and R. V. Churchill, Mc-Graw Hill, 2004.
3. Advanced Engineering Mathematics, (9th Edition), Erwin kreyszig, John Wiley & Sons, 2006.
4. Calculus and Analytic Geometry, (9th Edition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
5. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2008.
6. Higher Engineering Mathematics, (11th Reprint), Ramana B.V., Tata McGraw Hill New Delhi, 2010.
7. Mathematics-III by T.K.V. Iyengar, B. Krishna Gandhi & Others, 2013 Yr. Edition S.Chand.
8. Applied Mathematics for Engineers & Physicists (3rd edition) by Pipes &Harvill , McGraw Hill International Book company.

Course Outcomes

On completion of the course students will be able to

1. Solve ordinary differential equations using Laplace transform.
2. Find the root of given equation and estimate unknown value using interpolation.
3. Find numerical solutions of ordinary differential equations.
4. Analyze the complex function with reference to their analyticity.
5. Evaluate integrals using Cauchy's integral and residue theorems, Taylor's and Laurent's series expansions of complex function.

(A30401) ELECTRONIC DEVICES & CIRCUITS
(Common for ECE and EEE)

B. Tech. (ECE) III-Semester

L	T	P	C
3	0	0	3

UNIT-I

P-N Junction Diode: Qualitative Theory of P-N junction, P-N junction as a Diode, Diode Equation, Volt-Ampere Characteristics, Temperature dependence of V-I characteristics, Static & Dynamic Resistance levels. Transition and Diffusion Capacitances, Diode Equivalent Circuits, Load Line Analysis, Breakdown Mechanisms in Semiconductor Diodes, Zener Diode Characteristics, Zener Voltage Regulator.

Special Purpose Electronic Devices: Principle of Operation and Characteristics of Tunnel Diode (with the help of Energy Band Diagram), Varactor Diode, SCR and Photo Diode.

UNIT-II

Rectifiers and Filters: Diode as a Rectifier, Half wave Rectifier, Full wave Rectifier, Bridge Rectifier, Harmonic components in a Rectifier Circuit, Inductor Filter, Capacitor Filter, L- Section Filter, π- Section Filter, Comparison of Filters.

UNIT-III

Bipolar Junction Transistor and UJT: The Junction Transistor-Current Components, Construction and Operation, Types of BJT configurations-Common Base, Common Emitter and Common Collector, Limits of operation, BJT Specifications, h - parameter analysis for CE,CB& CC. UJT and its characteristics.

UNIT-IV

Transistor Biasing and Stabilization: Operating Point, DC and AC Load lines, Need for Biasing, Fixed Bias, Collector to base bias, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against variations in V_{BE} and β, Bias Compensation using Diodes and Transistors, Thermal Runaway, Thermal Stability, Analysis of a transistor amplifier circuit using h- parameters. Comparison of CB, CE, and CC amplifiers.

UNIT-V

Field Effect Transistor and FET Amplifiers: Junction Field Effect Transistor (Construction & principle of operation), Pinch-off Voltage, Volt-Ampere characteristics, FET as Voltage Variable Resistor, Comparison of BJT and FET, The JFET small signal model, MOSFET (Construction & principle of operation), MOSFET Characteristics in Enhancement and Depletion modes.

FET Amplifiers: Biasing of FET, Common Source Amplifier, Common Drain Amplifier and Common Gate Amplifier.

Text Books

1. Millman's Electronic Devices & Circuits-J. Millman, C.C. Halkais&Satyabrata Jit, 2 Ed., 1998, TMH.
2. Electronic Devices and Circuits- R.L. Boylstad and Louis Nashelsky, 9 Ed., 2006, PEI/PHI

Reference Books

1. Integrated Electronics- J. Millman and Christos C. Halkais, 1991 Ed., 2008, TMH.
2. Electronic Devices & Circuits- David A. Bell, 5 Ed, Oxford
3. Electronic Devices & Circuits- Mohammad Rashid, Cengage Learning, 2013
4. Electronic Devices and Circuits- K. Lal Kishore, 2 Ed., 2005, BSP.
5. Electronic Devices and Circuits- Anil K. Maini, Varsha Agarwal, 1 Ed., 2009, Wiley India Pvt Ltd.
6. Electronic Devices and Circuits- S. Salivahanan, N. Suresh Kumar, A. Vallavaraj, 2 ed., 2008, TMH.

Course Outcomes

At the end of the course the student will be able to:

1. Analyze the characteristics of different diodes and its applications.
2. Explain various rectifier circuits with and without filters.
3. Explain the characteristics of BJT and UJT.
4. Design and analysis of various biasing circuits.
5. Explain the characteristics of FET and analyze various FET amplifier circuits.

(A30224) ELECTRICAL ENGINEERING

B. Tech. (ECE) III-Semester

L	T	P	C
3	0	0	3

UNIT-I

DC Circuits: Circuit Concept – R-L-C parameters – Voltage and Current sources Ohm's law, Kirchhoff's laws, types of sources, source transformations, V-I relation for passive elements, series parallel circuits, star –delta and delta –star transformations, mesh and nodal analysis, network theorems –super position, thevenin's, maximum power transfer theorem, simple problems.

UNIT-II

AC circuits: Representation of sinusoidal waveforms, waveforms and basic definitions, RMS and Average values of the alternating quantity, form factor and peak factor, phasor representation of alternating quantities, the 'j'operator and phasor algebra, Analysis of AC circuits with single basic network elements. Single phase series circuits. Resonance – Series, parallel circuits, concept of band width and Q factor

Three phase circuits –phase sequence, star and delta connection, relation between line and phase voltage and currents in a balanced system

UNIT-III

Transient Behavior and Network Functions: Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis,

Transient analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms.

Concept of complex frequency, Driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, Two port network and interconnections,

UNIT-IV

Transformer: Single phase transformer-Principle and operation, construction details, Ideal transformer and practical transformer, equivalent circuit, losses, OC and SC Test, Efficiency and Regulation calculation, simple problems.

UNIT-V

Electrical Machines: DC Machines: Principle of operation of DC Generator & motor – EMF equation - types – DC motor types –torque equation – applications

AC Machines: Construction and Principle of operation of Three Phase induction motor and Synchronous Generator.

Text Books

1. Sudhakar, A., Shyammohan, S. P.; “Circuits and Network”; Tata McGraw-Hill NewDelhi, 1994
2. J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.

Reference Books

1. Van, Valkenburg.; “Network Analysis” ; Prentice hall of India, 2000
2. A William Hayt, “Engineering Circuit Analysis” 8th Edition, McGraw-Hill Education
3. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
4. Textbook of Electrical Technology: AC and DC Machines (Volume - 2), B. L. Theraja A. K. Theraja

Course Outcomes:

On Completion of the course, students will be able to

1. Apply Kirchoff‘s Laws & network reduction techniques.
2. Explain AC fundamentals of single & three phase circuits.
3. Analyze the Transient behavior and describe parameters of two port networks.
4. Acquire the knowledge of operation and performance Analysis of transformers.
5. Illustrate the operation and constructional features of electrical machines.

(A30402) PROBABILITY & STOCHASTIC PROCESSES

B. Tech. (ECE) III-Semester

L	T	P	C
3	1	0	4

UNIT-I

Probability: Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes Theorem and Independent Events

The Random Variable: Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete and Continuous and Mixed Random Variables.

UNIT-II

Distribution and Density Functions: Distribution and Density functions and their Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties.

Operation on one Random Variable Expectations : Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable, Transformation of a Discrete Random Variable.

UNIT-III

Multiple Random Variables: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density Point Conditioning, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables.

Operations on Multiple Random Variables: Expected Value of a Function of Random Variables: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

UNIT-IV

Stochastic Processes-Temporal Characteristics

The Stochastic process, concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationary and Statistical Independence. First-Order Stationary Processes, Second- order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationary, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and its Properties, Cross-Correlation Function and Its Properties, Covariance and its properties, Linear system response of mean and mean-squared value, Autocorrelation function, Cross-correlation functions, Gaussian Random Processes, Poisson Random Process.

UNIT-V

Stochastic Processes-Spectral Characteristics

The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, the Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density spectrum of response, Cross-Power Spectral Density of Input and Output of a linear system.

Text Books

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001.
2. Principles of communication systems H Taub, Donald L Schilling, GouthamSaha 2007 TMH

References

1. Probability, Random Variables and Stochastic Processes - Athanasios Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002.
2. Theory of probability and stochastic Processes- Pradeep Kumar Ghosh
3. Probability and Random Processes with application to signal processing -Henry stark and john w woods 3rd PE
4. Probability Methods of signal and system analysis - George r cooper clave d mc giflem 3ed 1999 oxford.

5. Statistical theory of communication - sp Eugene Xavier 1997 new age publications.

Course Outcomes

On Completion of the course, students will be able to

1. Describe the axiomatic formulation of modern Probability Theory and random variables.
2. Summarize probability models and function of random variables based on single & multiples random variables.
3. Evaluate the moments & characteristic functions of random variables.
4. Explain the concept of the random processes and spectral density of stationary random processes with examples.
5. List specific applications to Poisson and Gaussian processes.

(A30403) SWITCHING THEORY & LOGIC DESIGN
(Common for ECE and EEE)

B. Tech. (ECE) III-Semester

L	T	P	C
3	0	0	3

UNIT-I

Number System and Boolean algebra and Switching Functions

Number Systems, Base Conversion Methods, Complements of Numbers, Codes – Binary Codes, BCD Code and its Properties, Gray Code, Excess-3 Code, Alpha Numeric Codes, Error Detecting and Correcting Codes.

Boolean Algebra: Basic Theorems and Properties, Switching Functions, Canonical / Standard form representations, Boolean Function Simplifications, Logic Gates, Properties of XOR Gates & Universal Gates, Multilevel NAND/NOR Realizations.

UNIT-II

Combinational Circuit Design: Introduction to the functions Minimization with Theorems, The Karnaugh Map (K-map) Method, Five and Six Variable Maps, Prime Implicants and Essential Implicants, Don‘t Care Map Entries, Minimization using tabular method, Partially Specified Expressions, Multilevel Output Function minimization, Arithmetic Circuits, Encoder and Decoder,Comparator, Multiplexers and Demultiplexers, Code-converters.

Memories: ROM, RAM, PROM, EPROM, PLA, PAL.

UNIT-III

Sequential Machines Fundamentals: Introduction, comparision of Combinational and Sequential Circuits, Latches & Flip-flops, Types of Flip flops, Clocked Flip Flops-(JK, T, D flip-flops), Master Slave JK Flip Flop, Race around condition, Design of a Clocked flip-flop, Conversion of Flip Flops, Timing and Triggering Considerations.

UNIT-IV

Sequential Circuit Design and Analysis: Introduction, State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Design Aspects, State Reduction, Realization using Flip-Flops.

Counters–Design of Single Mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter using Shift Register.

UNIT-V

FSM and ASM Charts: Finite State Machine- Capabilities and Limitations, Mealy and Moore Models, Minimization of Completely Specified and Incompletely Specified Sequential Machines, Partition Techniques and Merger GraphMethods and Concept of Minimal Cover Table.

Algorithmic State Machines: Salient Features of the ASM Chart, Weighing Machine and Binary Multiplier.

Text Books

1. Switching & Finite Automata Theory - ZviKohavi, & Niraj K. Jha, 3rd Edition, Cambridge.
2. Digital Design -Morris Mano, PHI, 3rd Edition, 2006.

Reference Books

1. Introduction to Switching Theory and Logic Design - Fredriac J. Hill, Gerald R. Peterson, 3rd ED, John Wiley & Sons Inc
2. Digital Fundamentals – A Systems approach-Thomas L. Floyd, Pearson, 2013.
3. Digital Logic Design- Ye Brian and Holdsworth, Clive Woods, Elsevier.
4. Digital Logic Applications and Design - John M. Yarbrough, Thomson Publications, 2006.
5. Digital Logic and State Machine Design – David J. Comer, 3rdEdition, Oxford, 2013.

Course Outcomes

Upon Completion of the Course, Students will be able to

1. Identify the various numeric and binary Numbers.
2. Apply the basic theorems to simply the Boolean Functions.
3. Design simple Combinational Circuits.
4. Design simple Sequential Circuits.
5. Distinguish the Finite State Machines and Algorithmic State Machines Charts.

(A30016) GENDER SENSITIZATION

B. Tech. (ECE) III-Semester

L	T	P	C
0	0	2	0

UNIT-I
Understanding Gender
Lesson 1 – Gender: Why should we study it?
Lesson 2 – Socialization: Making Women, Making Men
Lesson 12 – Just Relationships: Being together as Equals

UNIT-II
Gender and Biology
Lesson 4 – Missing Women: Sex selection and its consequences
Lesson 10 – Gender Spectrum: Beyond the Binary
Lesson 13 – Additional Reading: Our Bodies, Our Health

UNIT-III
Gender and Labour
Lesson 3 – Housework: The Invisible Labour
Lesson 7 – Women's Work: Its Politics and Economics

UNIT-IV
Issues of Violence
Lesson 6 – Sexual Harassment: Say No!
Lesson 8 – Domestic Violence: Speaking Out
Lesson 11 – Thinking about Sexual Violence

UNIT-V
Gender Studies
Lesson 5 – Knowledge: Through the Lens of Gender
Lesson 9 – Who's History? Questions for Historians and Others.

Course Outcomes

1. Identify realities of gender discrimination prevalent in the society at all levels.
2. Infer and discuss historical evidences, perspective and voices of discrimination against women in all societies and civilizations.
3. Identify, protest and overcome the evils of body shaming.

4. Analyze discrimination and exploitation of women labour in domestic as well as social sphere. Learners infer women's rights, women's wage disparities, women's issues and demonstrate these grievances through law.
5. Identify different types of sexual exploitation; sexual violence and marital violence show empathy towards victims of such violence and generate public opinion in face of any exploitation.

(A30404) ELECTRONIC DEVICES & CIRCUITS LAB
(Common for ECE and EEE)

B. Tech. (ECE) III-Semester

L	T	P	C
0	0	3	1.5

PART A: (Only for viva voce Examination)
Electronic Workshop Practice (in 3 lab sessions):

1. Identification and Specifications, testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards. PCBs
2. Identification, and Specifications, testing of Active Devices, Diodes, BJTs,
3. Low power JFETs, MOSFETs, Power Transistors, LEDs, LCDs, Optoelectronic Devices, SCR, UJT.
4. Study and operation of
    a. Multi meters (Analog and Digital)
    b. Function Generator
    c. Regulated Power Supplies
    d. CRO.

PART B: (For Laboratory examination - Minimum of 10 experiments to be conducted)

1. Forward & Reverse Bias Characteristics of PN Junction diode.
2. Zener diode characteristics and Zener as Voltage regulator.
3. Input & Output characteristics of Transistor in CB configuration and h-parameter calculations.
4. Input & Output characteristics of Transistor in CE configuration and h-parameter calculations
5. Half wave Rectifiers with & without filters.
6. Full wave Rectifiers with & without filters.
7. FET characteristics
8. Design of self - bias circuit
9. Frequency response of CC Amplifier
10. Frequency response of CE Amplifier (Emitter Follower).
11. Frequency response of Common Source FET amplifier.
12. SCR characteristics.
13. UJT characteristics.

PART C: Equipment required for Laboratories:

1. Regulated Power supplies (RPS) - 0-30v
2. CROs: 0-20 MHz
3. Function Generators: 0-1 MHz
4. Multi meters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital): 0-20µ A, 0-50 µA, 0-100 µA, 0-200 µA, 0 – 10mA
8. Voltmeters (Analog or Digital): 0-50V, 0-100V, 0-250V
9. Electronic Components: Resistors, Capacitors, BJTs, LCDs, SCRs, UJTs, FETs, LEDs, MOSFETs, Diodes (Ge & Si type), transistors (NPN & PNP type)

Course Outcomes

On Completion of the course, students will be able to

1. Examine the characteristics of different diodes and its applications.
2. Design various rectifier circuits with and without filters.
3. Distinguish the characteristics of BJT, FET and UJT.
4. Design and analyze various BJT Amplifiers circuits.
5. Analyze various FET amplifier ciruits.

(A30225) ELECTRICAL ENGINEERING LAB

B. Tech. (ECE) III-Semester

L	T	P	C
0	0	3	1.5

PART - A

1. Verification of KCL and KVL.
2. Verification of Superposition and Reciprocity theorems
3. Verification of Maximum power transfer theorem.
4. Verification of Thevenin‘s and Norton‘s theorems.
5. Series and Parallel resonance in RLC Network
6. Two port network parameters- Z and Y parameters
7. Two port network parameters- ABDC and Hybrid Parameters.
8. Time Response of First Order RC/RL Network for periodic, non-sinusoidal inputs- time constant and steady state error determination.

PART - B

1. Magnetization characteristics of D.C. Shunt generator.
2. Swinburne‘s Test on DC shunt machine.
3. Brake test on DC shunt motor
4. OC and SC tests on Single-phase transformer.
5. Load Test on single phase Transformer

Note: Any 10 of the above experiments are to be conducted

Course Outcomes:

On Completion of the course, students will be able to

1. Verify KCL, KVL & different theorems.
2. Calculate different two port network parameters.
3. Explain resonance phenomena for RLC networks.
4. Analyze time response of RC/RL networks.
5. Acquire the knowledge of different tests conducted on DC machines and single phase transformers

IV SEMESTER

(A30405) SIGNALS & SYSTEMS
(Common for ECE and EEE)

B. Tech. (ECE) IV-Semester

L	T	P	C
3	0	0	3

UNIT-I

Signal Analysis and Fourier Series: Signal Analysis: Introduction, classification of signals, elementary signals and basic operations on signals. Analogy between vectors and signals, Orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions,

Fourier Series: Representation of Fourier series, Continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum

UNIT-II

Fourier Transforms and Sampling: Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function.

Sampling: Sampling theorem – Graphical and analytical proof for Band Limited Signals, Types of sampling- impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing.

UNIT-III

Signal Transmission through Linear Systems: Linear system, impulse response, Response of a linear system, linear time invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization.

UNIT-IV

Convolution and Correlation of Signals: Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property of Fourier transforms. Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Parseval‘s theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

UNIT-V

Laplace Transforms and Z-Transforms:

Laplace Transforms: Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T‘s relation between L.T‘s, and F.T. of a signal.

Z–Transforms: Fundamental difference between continuous and discrete time signals, Concept of Z- Transform of a discrete sequence. Distinction between Laplace, Fourier and Z transforms. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms.

Text Books

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.

References

1. Signals & Systems - Simon Haykin and Van Veen,Wiley, 2nd Edition.
2. Fundamentals of Signals and Systems Michel J. Robert, MGH International Edition, 2008.
3. Signals and Systems – Anand Kumar, PHI, 3rd Edition.
4. Signals and signals- Iyer and K.Satya Prasad, Cengage Learning.
5. Signals and Systems – A. Rama Krishna Rao-2008,TMH
6. Introduction to Signal and System Analysis-K .Gopalan 2009, Cengage Learning.

Course Outcomes

Upon completing this course the student will be able to

1. Describe the analogy between vectors and signals.
2. Analyze the signals in frequency domain using Fourier series and Fourier transform.
3. Classify the characteristics of different types of systems.
4. Apply and analyze the concepts of sampling, convolution and correlation.
5. Evaluate the response of the systems using Laplace and Z-transforms.

(A30406) ELECTRONIC & PULSE CIRCUITS

B. Tech. (ECE) IV-Semester

L	T	P	C
3	0	0	3

UNIT-I

Multi Stage Amplifiers: Analysis of Cascaded RC Coupled BJT amplifiers, Cascade Amplifier, Different Coupling, Darlington Pair, Schemes used in Amplifiers - RC Coupled Amplifier, Transformer Coupled Amplifier, Direct Coupled Amplifier.

Feedback Amplifiers: Concepts of Feedback, Classification of Feedback Amplifiers, General characteristics of Negative Feedback Amplifiers, Effect of Feedback on Amplifier Characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations, Illustrative Problems

UNIT-II

BJT amplifiers – Frequency response: Logarithms, Decibels, General frequency considerations, Frequency response of BJT amplifier, Analysis at Low and High frequencies, Effect of coupling and bypass Capacitors, The Hybrid- pi (π) - Common Emitter Transistor Model, CE Short Circuit Current Gain, Current Gain with Resistive Load, Emitter follower at higher frequencies

UNIT-III

Large Signal Amplifiers: Classification, Class A Large Signal Amplifiers, Transformer Coupled Class A Power Amplifier, Efficiency of Class A Amplifier, Class B Amplifier, Efficiency of Class B Amplifier, Class-B Push- Pull Amplifier, Complementary Symmetry Class B Push-Pull Amplifier, Distortion in Power Amplifiers, Thermal Stability and Heat Sinks.

UNIT-IV

Linear Wave Shaping: High pass and low pass RC circuits and their response for sinusoidal, step, pulse, square & ramp inputs, high pass RC network as Differentiator, and low pass RC circuit as an integrator

Non- Linear Wave Shaping Diode clippers, clipping at two independent levels, comparator, applications of voltage comparator, clamping operation, clamping circuit taking source and diode resistances into account, clamping circuit theorem.

UNIT-V

Multivibrators: Analysis of fixed biased Bistable multivibrator, self-biased Bistable multivibrator, commutating capacitors, methods of triggering of Bistable multivibrator, analysis of Monostable, triggering of Monostable multivibrator, calculation of pulse width of Monostable multivibrator, Analysis of Astable multivibrator, calculation of frequency of Astable multivibrator and Schmitt trigger using Transistors.

Text books

1. Millman‘s Pulse, Digital and Switching Waveforms- J.Millman, H.Taub and Mothaiki S. Prakash Rao, 2 Ed, 2008,TMH
2. Pulse and Digital Circuits- A. Anand Kumar, 2005, PHI

Reference books

1. Fundamentals of Pulse and Digital Circuits- Ronald J. Tocci, 3 Ed,2008
2. Pulse and Digital Circuits- MothekiS.Prakash Rao,2006,TMH
3. Wave Generation and Shaping- L. Strauss
4. Electronic Devices and Circuit Theory - Robert L.Boylestad, Louis Nashelsky, 9 Ed., 2008 PE.
5. Micro electric Circuits-Sedra and Smith-5Ed., 2009, Oxford University Press.
6. Electronic Devices and Circuits - S. Salivahanan, N.Suresh Kumar, A. Vallavaraj, 2 Ed., 2009, TMH.

Course Outcomes

At the end of the course, the student will be able to:

1. Design and analyze simple multistage amplifiers and feedback amplifier.
2. Analyze BJT amplifiers at high frequencies.
3. Design different large signal amplifiers.
4. Design different Linear and Nonlinear wave shaping circuits.
5. Design and analyze various multivibrator circuits.

(A30407) ANALOG & DIGITAL COMMUNICATIONS

B. Tech. (ECE) IV-Semester

L	T	P	C
3	1	0	4

UNIT-I

Amplitude Modulation: Modulation, Need for modulation, FDM, Amplitude Modulation-Time and Frequency domain, single tone modulation, power relations, Generation of AM wave with switching modulator, Detection of AM Waves using Envelope detector, DSB-SC: Time and Frequency domain, Generation of DSB-SC-Ring Modulator, Coherent detection, Hilbert transform and properties, SSB-SC: Time and Frequency domain, Generation of SSB-Frequency and Phase discrimination method, Demodulation of SSB.

UNIT-II

Angle Modulation: Frequency Modulation: Single tone Frequency Modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Transmission bandwidth of FM Wave, Generation of FM Waves-Direct and Indirect FM, Detection of FM Waves: Foster Seeley Discriminator, Phase locked loop, Comparison of FM and AM. Noise: Types of Noise, Modelling of noise and AWGN, Comparison of Noise performance in AM, DSBSC, SSB & FM (without derivations), Pre-emphasis and De-emphasis, Super heterodyne Receiver.

UNIT-III

Pulse Analog Modulation: Sampling theorem, Types of sampling process, Types of Pulse Modulation, PAM- Generation and Demodulation, PWM- Generation and Demodulation, PPM-Generation and Demodulation, TDM.

Pulse Digital Modulation: PCM, Generation and Reconstruction, Quantization Noise, DPCM, DM and Adaptive DM, Noise in PCM and DM.

UNIT-IV

Digital Carrier Modulation Schemes:

Optimum Receiver for Binary Digital Modulation Schemes, Description of Binary ASK, FSK, PSK and QPSK Schemes, Transfer Function of the matched filter, Bandwidth and Probability of Error calculations of binary ASK, FSK, PSK and QPSK (Coherent schemes), Comparison of Digital Modulation Schemes. Introduction to QAM, Signal space representation of binary- ASK, PSK, FSK, QPSK and QAM.

UNIT-V

Concepts of Information theory:

Information, Entropy, Shannons Hartley law, Source coding Techniques-Huffman coding, Shannon-Fano coding, and channel coding techniques.

Textbooks

1. Communication Systems - Simon Haykin, 2^{nd} Ed., Wiley publications
2. Digital and Analog Communication Systems – Sam Shanmugam, John Wiley, 2005.

Reference Books

1. B.P. Lathi, Communication Systems, BS Publication, 2004.
2. R.P.Singh and S.D Sapre, Communication Systems Analog and Digital, TMH, 2006.
3. Wayne Tomasi, Electronics communications systems: Fundamentals through advanced, 5th Edition, Pearson, 2004.
4. Principles of communication systems – Herbert Taub, Donald L Schiling, Goutam Saha,3rd Edition, McGraw-Hill, 2008.
5. Digital Communications- John G. Proakis, Masoud Salehi- 5 th Edition, Mcgarw- Hill,2008

Course Outcomes

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

1. Analyze different modulation and demodulation schemes for Analog & digital communications.
2. Evaluate fundamental communication system parameters.
3. Calculate basic system parameter of baseband data transmission systems.
4. Explain the concept of source coding and channel coding techniques.
5. Explain the concept of channel coding technique.

(A30408) ELECTROMAGNETIC WAVES & TRANSMISSION LINES

B. Tech. (ECE) IV-Semester

L	T	P	C
3	1	0	4

UNIT-I

Electrostatics: Coulomb‘s Law, Electric Field Intensity- Fields due to Different charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell‘s Two Equations for Electrostatic fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson‘s and Laplace Equations; Illustrative Problems.

UNIT-II

Magnetostatics: Biot-Savart‘s Law, Ampere‘s Circuital Law and Applications, Magnetic Flux Density, Maxwell‘s Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere‘s Force Law, Inductances and Magnetic Energy, Illustrative Problems.

Maxwell‟s Equations (Time Varying Fields): Faraday‘s Law and Transformer EMF, Inconsistency of Ampere‘s Law and Displacement Current Density, Maxwell‘s Equations in differential Forms. Conditions at a Boundary Surface: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems

UNIT-III

EM Wave Characteristics: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane waves- Definition, All Relations Between E & H, Sinusoidal variations, Wave Propagation in lossless and lossy Media, Conductors & Dielectrics- Characterization, Wave Propagation in Good Conductors and good Dielectrics, Polarization, Illustrative Problems. Reflection and Refraction of plane waves- Normal and Oblique incidences for both perfect Conductor and perfect Dielectrics, Brewster Angle, Critical Angle and Total internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem-Applications, Illustrative problems.

UNIT-IV

Transmission Lines-I: Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for characteristic impedance, Propagation Constant, Phase and Group Velocities, Infinite line Concepts, Losslessness/Low Loss Characterization, Distortion – Condition for Distortionlessness and minimum Attenuation, Loading- Types of Loading, Illustrative problems.

UNIT-V

Transmission Lines-II: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR, UHF Lines as Circuit Elements: **λ/4, λ/2, λ/8** Lines, Impendence Transformations, Smith Chart – Construction and Applications, Single and Double Stub Matching, Illustrative Problems.

Text Books

1. Elements of Electromagnetics- Mattew N.O. Sadiku, 4th Ed, Oxford Univ.Press.
2. Transmission Lines and Networks- Umesh Sinha, Satya Prakashan, 2001, (Tech India Publications), New Delhi.

Reference Books

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2nd, 2000, PHI.
2. Electromagnetic Field Theory and Transmission Lines – G. Sashibhushana Rao, Wiley Inia, 2013.

Course Outcomes

Upon successful completion of the course, students will be able to:

1. Explain the concepts of electrostatics using vector calculus and coordinate systems.
2. Explain the magnetic field intensity using Biot-Savart's law and Ampere's law.
3. Outline the characteristics of electromagnetic waves and describe Poynting theorem.
4. Summarize the various characteristics of transmission line.
5. Analyze transmission line parameters and stub matching using Smith chart.

(A30230) CONTROL ENGINEERING

B. Tech. (ECE) IV-Semester

L	T	P	C
3	0	0	3

UNIT-I

Introduction: Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems

UNIT-II

Transfer Function Representation: Transfer Function of DC Servo motor - AC Servo motor, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction uses Mason‘s gain formula.

UNIT-III

Time Response Analysis: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

Stability Analysis in S-Domain The concept of stability – Routh‘s stability criterion – qualitative stability and conditional stability – limitations of Routh‘s stability

Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT-IV

Frequency Response Analysis: Introduction, Frequency domain specifications-Bode diagrams - Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin - Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots-Stability Analysis-Applications of Nyquist criterion to find the stability.

UNIT-V

State Space Analysis of Continuous Systems: Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it‘s Properties – Concepts of Controllability and Observability

Text Books

1. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John wiley and son‘s.,
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2nd edition.

Reference Books

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998
2. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.
3. Control Systems Engg. by NISE 3rd Edition – John wiley
4. Modeling & Control of Dynamic Systems‖ by Narciso F. Macia George J. Thaler, Thomson Publishers.

Course Outcomes

On completion of the course students will be able to

1. Explain the need for feedback control systems.
2. Obtain mathematical models of simple Electrical and mechanical systems
3. Evaluate the performance of a linear system in frequency and time domains.
4. Determine the stability of a linear control system. Design classical controllers for given system response.
5. Analyze linear systems in state space domain.

(A30021) SOCIAL INNOVATION IN PRACTICE
(Common for all branches)

B. Tech. (ECE) IV-Semester

L	T	P	C
0	0	2	1

UNIT I

Identify community issues to be addressed, Requirements Analysis: Extensive User requirements analysis, Generating effective System Requirement document.

UNIT II

Social Innovation – Case Studies Presentation of the case studies with a focus on impact and vision on society.

UNIT III

Process of Social Innovation Prompts – identifying needs, Proposals – generating ideas, Prototyping – testing the idea in practice,

UNIT IV

Sustaining-developing a business model, Scaling and diffusion-growing social innovations, Systematic change.

UNIT V

Report writing, Documentation and Panel presentation

Reference Books

1. Requirements Analysis: From Business Views to Architecture; David C. Hay; Prentice Hall Professional
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, YeheskelHasenfeld; Palgrave Macmillan
3. Social Enterprise Law: Trust, Public Benefit and Capital Markets By Dana Brakman Reiser & Steven A. Dean

Course Outcomes

On Completion of the course, the students will be able to

1. Identify several social issues to be addressed
2. Analyse the impact of social innovations on the society
3. Analyze the process of scoial innovation for a community problem
4. Develop a scalable business model.
5. Analyse the feasibility and economical factors

(A30015) SOFT SKILLS & PROFESSIONAL ETHICS

B. Tech. (ECE) IV-Semester

L	T	P	C
0	0	2	0

UNIT-I
Business Communication Skills:
English Language Enhancement the Art of Communication.

UNIT-II
Intrapersonal & Interpersonal Relationship Skills:
- Intrapersonal Relationships
- Interpersonal Relationships – To be an Effective Team Player

UNIT-III
Campus to Company:
- Corporate Dressing
- Corporate Grooming
- Business Etiquette
- Communication Media Etiquette

UNIT-IV
Group Discussions, Interviews and Presentations:
- Group Discussions
- Interviews
- Presentations

UNIT-V
Entrepreneurial Skills Development:
- Goal Setting
- Entrepreneurial Skills – Awareness and Development

References
1. UNLEASH the power within Soft Skills – Training Manual (Infosys Campus Connect)

Course Outcomes
At the end of the course, the students will be able to
1. Express themselves with proper pronunciations and sentence construction
2. Demonstrate a strong teamwork and be a team player

3. Develop a strong personal etiquette
4. Demonstrate good leadership qualities
5. Recognize and identify basic English grammar

(A30409) BASIC SIMULATION LAB

B. Tech. (ECE) IV-Semester

L	T	P	C
0	0	3	1.5

Note: Minimum of 12 experiments to be conducted from the following.

List of Experiments:

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as UNIT impulse, UNIT step, square, saw tooth, triangular, sinusoidal, ramp, sinc.
3. Operations on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.
4. Finding the even and odd parts of signal/ sequence and real and imaginary parts of signal.
5. Convolution between signals and sequences.
6. Autocorrelation and cross correlation between signals and sequences.
7. Verification of linearity and time invariance properties of a given continuous/discrete system.
8. Computation of UNIT sample, UNIT step and sinusoidal responses of the given LTI system and verifying its physical realizability and stability properties.
9. Gibbs phenomenon.
10. Finding the Fourier transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform synthesis using Laplace Transform
12. Locating the zeros and poles and plotting the pole-zero maps in S plane and Z-plane for the given transfer function.
13. Generation of Gaussian noise (real and complex), computation of its mean, M.S. Value and its Skew, Kurtosis, and PSD, Probability Distribution Function.
14. Sampling theorem verification.
15. Removal of noise by autocorrelation / cross correlation.
16. Extraction of periodic signal masked by noise using correlation.
17. Verification of Weiner-Khinchine Relations
18. Checking a random process for stationarity in wide sense

Course Outcomes

Upon completing this course the student will be able to

1. Examine various signals and demonstrate different operations using MATLAB.
2. Evaluate the Fourier transform of a signal and Plot it's magnitude and phase spectrum.
3. Test the sampling theorem using MAT lab
4. Examine a WSS Random process.
5. Describe the waveform synthesis using laplace tranform and plot pole zero maps in s plane and z plane.

(A30410) ELECTRONIC& PULSE CIRCUITS LAB

B. Tech. (ECE) IV-Semester

L	T	P	C
0	0	3	1.5

List of Experiments (Minimum 12 experiments to be done):

PART – 1: Electronic Circuits Minimum Eight experiments to be conducted:

I. **Design and simulation in simulation laboratory using any simulation software(Minimum 6 experiments):**
   1. Common Emitter Amplifier
   2. Common Source Amplifier
   3. Two Stage RC Coupled Amplifier
   4. Current Shunt and Voltage Series Feedback Amplifier
   5. Cascode Amplifier
   6. Wein Bridge Oscillator using Transistors
   7. RC Phase Shift Oscillator using Transistors
   8. Class A Power Amplifier (Transformer less)
   9. Class B Complementary Symmetry Amplifier.
   10. Common Base(BJT) / Common Gate (JFET) Amplifier

II. **Testing in Hardware Laboratory (Minimum 2 experiments):**
   1. Class A power Amplifier (With transformer load)
   2. Class C Power Amplifier
   3. Hartley & Colpitts Oscillators.
   4. Darlington Pair Transistor amplifier.

PART – II: Pulse Circuits (Minimum 4 experiments):

1. Linear Wave Shaping
   a. RC Low Pass Circuit for different time constants
   b. RC High Pass Circuit for Different time constants
2. Transfer characteristics and response of different clipper circuits.
3. The Steady State Output Waveform of Clamper circuits for a Square wave input.
4. Design a Bistable multivibrator and draw its waveforms
5. Design an Astable multivibrator and draw its wave forms
6. Design a Monostable multivibrator and draw its waveforms

Equipment Required for the Laboratory:

1. For Software Simulation of Electronic Circuits

- Computer Systems with Latest Specifications
- Connected in LAN (Optional)
- Operating System (Windows XP)
- Suitable Simulation Software

2. For Hardware Simulation of Electronic Circuits
    - Regulated Power Supply (0 – 30 V)
    - CRO's (0 – 20 MHz)
    - Function Generator (0 – 1M Hz)
    - Components
3. Windows XP/ Linux etc.

Course Outcomes

At the end of the course, the student will be able to:

1. Design and analyze simple single and multi-stage amplifiers using appropriate experimentation setup and simulation software.
2. Analyze different negative feedback amplifiers using appropriate experimentation setup and simulation software.
3. Analyze different power amplifiers using appropriate experimentation setup and simulation software.
4. Design different linear and nonlinear circuits using appropriate experimentation setup.
5. Design and analyze different multivibrator and oscillator circuits using appropriate experimentation setup and simulation software.

V SEMESTER
(A30411) ANTENNAS & WAVE PROPAGATION

B. Tech. (ECE) V-Semester

L	T	P	C
3	0	0	3

Unit-I: Antenna basics
Introduction, basic antenna parameters- patterns, beam area, radiation intensity, beam efficiency, directivity – gain- resolution, antenna apertures, effective height, illustrative problems. Fields from oscillating dipole, field zones, front-to-back ratio, antenna theorems, Retardedpotentials-Helmholtz theorem.
Thin linear wire antennas-Radiation from small electric dipole, quarter wave monopole and half wave dipole-current distributions, field components, radiated power, radiation resistance, beam width, directivity, effective area and effective height, natural current distributions, far fields and patterns of thin linear centre feed antennas of different lengths, illustrative problems. Loop antennas - introduction, small loop, comparison of far fields of small loop and short dipole, radiation resistances and directivities of small and large loops (qualitative treatment).

Unit-II: VHF, UHF and Microwave Antennas-I
Arrays with parasitic elements- Yagi-Uda array, folded dipoles and their characteristics, helical antennas-helical geometry, helix modes, practical design considerations for monofilar helical antenna in axial and normal modes, horn antennas - types, fermat's principle, optimum horns, design considerations of pyramidal horns, illustrative problems.

Unit-III: VHF, UHF and Microwave Antennas-II
Micro strip antennas- introduction, features, advantages and limitations, rectangular patch antennas-geometry and parameters, characteristics of micro strip antennas. Impact of different parameters on characteristics,
Reflector antennas-Introduction, flat sheet and corner reflectors, paraboloidal reflectors-geometry, pattern characteristics, feed methods. Illustrative problems.
Lens antennas- Introduction, geometry of non-metallic dielectric lenses, zoning, tolerances and applications.

Unit-IV: Antenna Arrays

Point sources-definition, patterns, arrays of 2 isotropic sources-different cases, principle of pattern multiplication, uniform linear arrays-Broadside arrays, Endfire arrays, EFA with increased directivity, derivation of their characteristics and comparison, BSA with non-uniform amplitude distributions-general considerations and binomial arrays, illustrative problems.

Antenna measurements: Introduction, concepts – Reciprocity, near and far fields, coordinate system, sources of errors. Patterns to be measured, pattern measurement arrangement, directivity measurement, gain measurements (by comparison, absolute and 3 –antenna methods).

Unit-V: Wave Propagation-I

Introduction, definitions, categorizations and general classifications, different modes of wave propagation. Ground wave propagation (qualitative treatment) for flat earth reflections, space and surface waves, wave tilt, curved earth reflections.

Space wave propagation - Introduction, field strength variation with distance and height, effect of earth's curvature, absorption, super refraction, M-curves and duct propagation, scattering phenomena, tropospheric propagation.

Wave Propagation– II: sky wave propagation- Introduction, structure of ionosphere, refraction and reflection of sky waves by ionosphere, Ray path, critical frequency, MUF, LUF, virtual height and skip distance. Relation between MUF and skip distance, multi-hoppropagation.

Text books:

1. Antennas and Wave Propagation – J. D. Kraus, R. J. Marhefka And Ahmad S.Khan, TMH, New Delhi, 4th Ed., (Special Indian Edition), 2010.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan And K.G. Balmain, Phi, 2nd Ed., 2000.

Reference books:

1. Antenna Theory-C.ABalanis, John Wiley &Sons, 3rd Ed., 2005.
2. Antennas and Wave Propagation-K.D.Prasad, Satyaprakashan, Tech India Publications, New Delhi, 2001.

3. Transmission and Propagation-E.V.D.Glazierand.R.L.Lamont, The Services Text Book Of Radio, Vol.5, Standard Publishers Distributors, Delhi.
4. Electronic and Radio Engineering-F.E.Terman, Mcgraw-Hill, 4th Edition, 1955.
5. Antennas-John D.Kraus, Mcgraw-Hill (International Edition), 2nd Ed.1988.

Course Outcomes

At the end of the course the student will be able to:

1. Explain the basic concept of radiation mechanism of antenna, define basic antenna Parameters and derive relation between them.
2. Explain constructional details, working principle and characteristics of different linear antennas, VHF, UHF and Microwave Antennas.
3. Analyze the antenna array concepts and apply this knowledge to design them.
4. Demonstrate techniques of measuring different antenna parameters and can interpret the results.
5. Explain different modes of propagation, their characteristics and applications.

(A30412) LINEAR & DIGITAL IC APPLICATIONS

B. Tech. (ECE) V-Semester

L	T	P	C
3	0	0	3

Unit-I: Operational Amplifier
Introduction to Op-Amps, Ideal and Practical Op-Amp, Op-Amp characteristics, DC and AC characteristics, Features of 741 Op-Amp, Modes of Operation- Inverting, Non-inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

Unit-II: Op-AmpApplications
Introduction to Active Filters, Characteristics of Band Pass, Band Reject and All Pass Filters, Analysis of 1st Order LPF & HPF Butterworth Filters, Waveform Generators- Triangular, Saw tooth, Square wave.
IC 555 & IC 565 Applications
IC 555 Timer- Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL- Block Schematic, Description of Individual Blocks, Applications.

Unit-III: Data Converters
Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different types of ADCs-Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

Unit-IV: Digital Integrated Circuits
Classification of Integrated Circuits, Comparison of Various Logic Families, CMOS Transmission Gate, IC interfacing-TTL driving CMOS & CMOS Driving TTL, Combinational Logic ICs-Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs- Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder /Subtractor, Magnitude Comparators.

Unit-V: Sequential Logic ICs and Memories
Familiarity with Commonly Available 74XX & CMOS 40XX Series ICs - All Types of Flip-Flops, Synchronous Counters, Decade counters, Shift Registers.
Memories- ROM Architecture, Types of ROMs & Applications, RAM Architecture, Static & Dynamic RAMs.

Text Books:

1. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 2003.
2. Linear Integrated Circuits -D. Roy Chowdhury, New Age International (p)Ltd, 2nd Ed., 2003.
3. Digital Fundamentals - Floyd and Jain, Pearson Education, 8th Edition, 2005.

Reference Books:

1. Op-Amps and Linear Integrated Circuits - Concepts and Applications - James M.Fiore, Cengage Learning/Jaico, 2009.
2. Operational Amplifiers and Liner Integrated Circuits by K.Lal Kishore -Pearson, 2009
3. Linear Integrated Circuits and Applications – Salivahana, TMH.
4. Modern Digital Electronics - RP Jain - 4/e - TMH, 2010.
5. Digital Design Principles and Practices – John F. Wakerly 3/e, 2005.
6. Operational Amplifiers with Liner Integrated Circuits, 4/e William D. Stanley, Pearson Education India, 2009.

Course Outcomes
At the end of the course the student will be able to:
1. Describe the characteristics and operating modes of OP-AMP.
2. Design and Analyze filters, oscillators, Wave form generators and voltage regulators using OP-AMP and 555 Timers.
3. Design & Analyze ADC and DAC Converters.
4. Design & Analyze various logic gates by using different logic families like TTL-74xx series and CMOS-40XX series.
5. Design and analyze various logic ICs and Memories.

(A30413) DIGITAL SIGNAL PROCESSING

B. Tech. (ECE) V-Semester

L	T	P	C
3	0	0	3

Unit- I: Introduction to Digital Signal Processing
Discrete time signals & sequences, linear shift invariant systems, stability and causality, linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems.
Realization of Digital Filters: Applications of Z-transforms, solution of difference equations of digital filters, System function, Stability criterion, Frequency response of stable systems, Realization of digital filters – Direct, Canonic, Cascade and Parallel forms.

Unit –II: Discrete Fourier series
DFS representation of periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT: Over – lap Add method, over – lap Save method, Relation between DTFT, DFS, DFT and Z-Transform.
Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 decimation-in-time and decimation – in-frequency FFT Algorithms, Inverse FFT, and FFT with general Radix-N.

Unit- III: IIR Digital Filters
Analog filer approximations- Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Step and Impulse invariant techniques, bilinear transformation method, spectral transformations.

Unit- IV: FIR Digital Filters
Characteristics of FIR Digital Filters, Frequency response, Design of FIR Filters: Fourier Method, Digital Filters using Window techniques, Frequency Sampling technique, Comparison of IIR & FIR filters.

Unit- V: Multirate Digital Signal Processing
Introduction, down sampling, Decimation, up sampling, interpolation, sampling rate conversion.
Finite word Length effects: Limit Cycles, Overflow oscillations, round-off noise in IIR digital filters, Computational output round off

Noise, Methods to prevent overflow, Tradeoff between Round off and overflow noise, Dead band effects.

Text Books:

1. Digital Signal Processing, Principles, Algorithms, and Applications, John G.Proakis, DimitrisG.Manolakis, Pearson Education /PHI, 2007.
2. Discrete Time Signal Processing - A.V. Oppenheim and R.W.Schaffer, PHI, 2009.
3. Fundamental ofDigital Signal Processing- LoneyLudeman, John Wiley, 2009.

References:

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008.
2. Fundamentals of Digital Signal Processing Using MATLAB – Robert J.Schilling, Sandra L.Harris, Thomson, 2007.
3. Digital Signal Processing - S.Salivahanan, A.Vallavaraj and C.Gnanapriya, TMH, 2009.
4. Discrete Systems and Digital Signal Processing with MATLAB – TaanS.EIAli, CRC press, 2009.
5. Digital Signal Processing – A practical approach, Emmanuel C.I `feachor and Barrie W.Jervis, 2nd Edition Pearson Education, 2009.
6. Digital Signal Processing - Nagoorkani, TMG, 2012.

Course Outcomes

At the end of the course the student will be able to:

1. Differentiate Time, Frequency and Z- transform analysis on signals and systems.
2. Analyze the fast computation of DFT and appreciate the FFT processing.
3. Explain the significance of various filter structures and effects of round off errors.
4. Design a digital filter for a given specification.
5. Compare the tradeoffs between normal and multi rate DSP techniques and finite length word effects.

(A30414) ELECTRONIC MEASUREMENTS & INSTRUMENTATION

B. Tech. (ECE) V-Semester

L	T	P	C
3	0	0	3

Unit- I: Block Schematic of Measuring Systems
Performance characteristics, Static characteristics, Accuracy, Resolution, Precision, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Volt meters, D'Arsonval Movement, DC Current Meters, AC voltmeters and Current Meters, Ohmmeters, Multi meters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

Unit –II: Signal Analysers
AF, HF Wave Analysers, Harmonic Distortion, Heterodyne Wave Analysers, Spectrum Analysers, Power Analysers, Capacitance-Voltage Meters, Oscillators, signal generator.
AF and RF signal generators, Sweep frequency Generators, pulse and Square wave Generators, Function Generators, Arbitrary waveform Generator, Video signal Generators, Specifications

Unit- III: Oscilloscopes
CRT, Block schematic of CRO, Defelection sensitivity, Time Base circuits, vertical Amplifier, Horizontal amplifier, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay Lines, Applications: Measurement of time, Period and Frequency specifications.
Special Purpose oscilloscopes: Dual trace, Dual Beam CROs, sampling oscilloscopes, storage oscilloscopes, digital storage CROs.

Unit- IV: Transducers
Classification, Strain gauges, Bounded, Un bounded; force and displacement transducers, Resistance Thermometers, hot wire anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital temperature sensing system. Piezo Electric transducers, Variable capacitance transducers, Magneto Strictive Transducer.

Unit- V: Bridges
Wheat stone bridge, Kelvin Double Bridge and Maxwell's Bridge, Schering Bridge
Measurement of Physical Parameters: Flow Measurement, displacement meters, Liquid level Measurements, Measurement of Humidity and Moisture, Velocity, Force, Pressure – High Pressure, Vacuum level, Temperature – Measurements, Data Acquisition Systems.

Text Books:

1. Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2003

References:

1. Electronic Instrumentation & Measurements - David A. Bell, Oxford Univ. Press, 1997.
2. Electronic Measurements And Instrumentation: B.M.Oliver, J.M.cage TMH reprint 2009.
3. Measurement Systems - Emest O. Doebelin and Dhanesh N Manik, 6th Ed., TMH.
4. Electronic Measurements & Instrumentations by K. Lal Kishore, Pearson Education – 2010.
5. Industrial Instrumentation: T.R.Padmanabham Springer 2009.

Course Outcomes

At the end of the course the student will be able to:

1. Explain the working principles of different electronic meters & Generators and explain the performance characteristics of measuring instruments.
2. Describe the concepts of different wave analyzers and their design.
3. Explain the constructional features, operations and applications of general and special purpose CROs.
4. Describe the working principle and Applications of different types of Sensors and Transducers.
5. Analyze different types of AC & DC Bridges and their applications.

(A30441) DIGITAL DESIGN THROUGH VERILOG HDL
(Professional Elective I)
B. Tech. (ECE) V-Semester

L	T	P	C
3	0	0	3

Unit I: Introduction to Verilog HDL
Verilog As HDL, Levels Of Design Description, Concurrency, Simulation and Synthesis, Function Verification, System Tasks, Programming Language Interface, Module, Simulation and Synthesis Tools.

Language Constructs and Conventions: Introduction, Keywords, Identifiers, White Space Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators.

Unit II: Gate Level Modelling
Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tristate Gates, Array of Instances of Primitives, Design of Flip-Flops with Gate Primitives, Delays, Strengths and Construction Resolution, Net Types, Design of Basic Circuit.

Modelling at Dataflow Level: Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vectors, Operators.

Unit III: Behavioural Modelling
Introduction, Operation and Assignments, Functional Bifurcation. ’Initial’ Construct, ‘Always’ Construct, Assignments With Delays, ’Wait’ Construct, Multiple Always Block, Design at Behavioural Level, Blocking And Non-Blocking Assignments, The ‘Case’ Statement, Simulation Flow, ’If’ and ‘If-Else ‘Constructs. ‘Assign-De-Assign’ Construct, ’Repeat’ Construct, For Loop, ‘The Disable’ Construct, ’While Loop’, For Ever Loop, Parallel Blocks. ’Force-Release’ Construct, Event.

Unit IV: Switch Level Modelling
Basic Transistor Switches, CMOS Switches, Bidirectional Gates, Time Delays with Switch Primitives, Instantiation with ‘Strengths’ and ’Delays’. Strength Contention with Trireg Nets.
System Tasks, Functions and Compiler Directives: Parameters, Path Delays, Module Parameters, System Tasks and Functions, File Based Tasks and Functions, Compiler Directives, Hierarchical Access, User Defined Primitives.

Unit V: Sequential Circuit Description
Sequential Models-Feedback Model, Capacitive Model, Implicit Model, Basic Memory Components, Functional Register, Static Machine Coding, Sequential Synthesis.
Component Test and Verification: Test Bench-Combinational Circuit Testing, Sequential Circuit Testing, Test Bench Techniques, Design Verification, Assertion Verification.

Text Books:
1. Fundamentals of Digital Logic withVeilog Design - Stephen Brown, ZvonkocVranesic, TMH, 2nd Edition, 2010.
2. Verilog Digital System Design –ZainalabdienNavabi, TMH, 2nd Edition.

Reference Books:
1. Design through Verilog HDL -T R. Padmanabhan, B. Bala Tripura Sundari, Wiley, 2009.
2. Advanced Digital Logic Design Using Verilog, State Machine & Synthesis For FPGA- Sunggu Lee, Cengage Learning, 2012.
3. Verilog HDL-Samir Palnitkar,2nd Edition, Pearson Education, 2009.
4. Advanced Digital Design with The Verilog HDL- Michel D.Ciletti, PHI, 2009.

Course Outcomes

At the end of the course the student will be able to:

1. Understand basic concepts of Verilog Hardware Description Language (HDL).
2. Describe the Behavioral models of various digital circuits.
3. Explain the Register Transfer Level (RTL) models of digital circuits.
4. Describe the standard cell libraries and FPGAs.
5. Synthesize and implement RTL models to standard cell libraries and FPGAs.

(A30442) TELECOMMUNICATIONS SWITCHING SYSTEMS & NETWORKS
(Professional Elective I)

B. Tech. (ECE) V-Semester

L	T	P	C
3	0	0	3

Unit- I

Switching System: Evolution of Telecommunications; Basics of a Switching Systems; Functions of a Switching Systems; Crossbar Switching- Principle of Crossbar Switching; Crossbar Switching Configurations; Cross- Point Technology; Crossbar Exchange Organization; General Trunking; Electronic Switching; Digital Switching Systems.

Telecommunications Traffic: Introduction; The UNIT Of Traffic; Congestion; Traffic Measurement; A Mathematical Model; Lost-Call Systems- Theory; Traffic Performance; Loss Systems in Tandem; Use of Traffic Tables; Queuing Systems- The Second Erlang Distribution; Probability of Delay; Finite Queue Capacity; Some Other Useful Results; Systems With A Single Server; Queue in Tandem; Delay Tables; Applications of Delay Formulae.

Unit- II

Switching Networks: Single Stage Networks; Gradings-Principle; Two Stage Networks; Three Stage Networks; Four Stage Networks.

Time Division Switching: Basic Time Division Space Switching; Basic Time Division Time Switching; Time Multiplexed Space Switching; Time Multiplexed Time Switching; Combination Switching; Three Stage Combination Switching.

Control of Switching Systems: Call Processing Functions-Sequence of Operations; Signal Exchanges; State Transition Diagrams; Common Control; Reliability; Availability And Security; Stored Program Control.

Unit - III

Signalling: Introduction; Customer Line Signalling; Audio Frequency Junctions and Trunk Circuits; FDM Carrier Systems-Out band Signalling; In band (VF) Signalling; PCM Signalling;

Inter Register Signalling; Common Channel Signalling Principles-General Signalling Networks; CCITT Signalling Systems Number 6; CCITT Signalling System Number 7; The High Level Data Link Control Protocol; Signal UNITs; The Signalling Information Field.

Unit- IV

Packet Switching: Introduction; Statistical Multiplexing; Local Area and Wide Area Networks-Bus Networks; Ring Networks; Compression of Bus and Ring Networks; Optical Fiber Networks; Large Scale Networks- General; Datagrams and Virtual Circuits; Routing; Flow Control; Standards; Frame Relay; Broadband Networks-General; The Asynchronous Transfer Mode; ATM Switches.

Unit- V

Networks: Introduction; Analog Networks; Integrated Digital Networks; Integrated Services Digital Networks; Cellular Radio Networks; Intelligent Networks; Private Networks; Charging; Routing-General, Automatic Alternative Routing.

Text Books:

1. Telecommunications Switching and Traffic Networks, J E Flood, Pearson Education, 2006.
2. Telecommunications Switching systems and Networks, TyagarajanViswanathan, PHI Pvt. Ltd., 2006.

Reference Books:

1. John C Bellamy, - Digital Telephony, John – Wiley International student Edition, 3rd Edition, 2000.
2. Behrouz A. Forouzan - Data Communications and Networking, TMH, 2nd Edition, 2002.
3. Tomasi - Introduction to Data Communications and Networking, Pearson Education, 1st Edition,2007.

Course Outcomes

At the end of the course the student will be able to:

1. Explain the concepts of telecommunication switching system.
2. Analyze and evaluate fundamental telecommunication trafficmodels.
3. Analyze the basic modem signaling system.
4. Explain the concept of packet switching.
5. Differentiate analog and digital networking systems.

(A30457) COMPUTER ORGANIZATION
(Professional Elective I)

B. Tech. (ECE) V-Semester

L	T	P	C
3	0	0	3

Unit-1

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set. Case study – instruction sets of some common CPUs

Unit-II

Data representation: signed number representation, fixed and floating-point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and-add, Booth multiplier, carry save multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

Unit-III

Introduction to x86 architecture. CPU control unit design: hardwired and micro-programmed design approaches, Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers – program controlled, interrupt driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCII, USB

Unit-IV

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. Parallel Processors: Introduction to parallel processors, Concurrent access to memory and cache coherency

Unit-V

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Text books:

1. "Computer Organization and Design: The Hardware/Software Interface", 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. "Computer Organization and Embedded Systems", 6th Edition by CarlHamacher, McGraw Hill Higher Education.

Reference books:

1. "Computer Architecture and Organization", 3rd Edition by John P. Hayes, WCB/McGraw- Hill
2. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
3. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.

Course Outcomes

On completion of the course students will be able to

1. Describe basic computer organization
2. Explain the design of Control Unit.
3. Illustrate Data representation in computer's memory
4. Describe Input-Output, Memory Organization.
5. Distinguish between RISC and CISC Instruction Set.

(A30017) INDIAN CONSTITUTION

B. Tech. (ECE) V-Semester

L	T	P	C
2	0	0	0

UNIT-I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution- Sources and constitutional history, Features- Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions; **State Government and its Administration** Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions

UNIT-III

A: Local Administration District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation,

B: Pachayati raj: Introduction, PRI: ZilaPachayat, Elected officials and their roles, CEO ZilaPachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT-IV

Concept and Development of Human Rights: Meaning Scope and Development of Human Rights, United Nations and Human Rights – UNHCR, UDHR 1948, ICCPR 1996 and ICESCR 1966, Human Rights in India: Protection of Human Rights Act,1993 (NHRC and SHRC), First, Second and Third Generation Human Rights, Judicial Activism and HumanRights.

UNIT-V

Election Commission: Election Commission- Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women

Reference Books:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd. NewDelhi
2. SubashKashyap, Indian Constitution, National BookTrust
3. J.A. Siwach, Dynamics of Indian Government &Politics
4. D.C. Gupta, Indian Government andPolitics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and PoliticsHans

E-Resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Course Outcomes:

At the end of the course, the student will be able to:

1. Identify the sources and understand the features and principles of Indian Constitution.
2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and Pachayati Raj.
4. Educate us about basic concepts and developments of HumanRights.
5. Gain knowledge on roles and functioning of Election Commission.

(A30018) ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

B. Tech. (ECE) V-Semester

L	T	P	C
2	0	0	0

UNIT I:

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

UNIT II:

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT III: Legal frame workand TK:
A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);
B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

UNIT IV:

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT V:

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

Reference Books:

1. Traditional Knowledge System in India, by AmitJha,2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan2012.
3. Traditional Knowledge System in India byAmitJha Atlantic publishers,2002

E-Resources:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. http://nptel.ac.in/courses/121106003/

Course outcomes:

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

1. Understand the concept of Traditional knowledge and its importance.
2. Know the need and importance of protecting traditionalknowledge.
3. Know the various enactments related to the protection of traditionalknowledge.
4. Understand the concepts of Intellectual property to protect the traditionalknowledge.
5. Compare and contrast the Indian Traditional knowledge with modern scientific perspectivies.

(A30560) INTRODUCTION TOARTIFICIAL INTELLIGENCE
(Common to ECE, EEE, CIVIL, MECH)

B. Tech. (ECE) V-Semester

L	T	P	C
2	0	0	0

Unit-I

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*)

Unit-II

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning.

Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining.

Unit-III

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Nonmonotonic Reasoning, Other Knowledge Representation Schemes.

Unit-IV

Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks.

Unit-V

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

TEXT BOOK:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice Hall, 2010.

REFERENCE BOOKS:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

Course Outcomes

After undergoing this course, the students will be able to:

1. Differentiate a program & script, and expalin python basics
2. Write applications using python datastructures and functions
3. Explain OOPs in python and Build User defined modules
4. Develop programs using fundamentals of perl
5. Design applications using advanced perl

(A30415) ANALOG &DIGITAL COMMUNICATIONS LAB

B. Tech. (ECE) V-Semester

L	T	P	C
0	0	3	1.5

Note: Minimum of 12 Experiments should be conducted

1. Amplitude Modulation andDemodulation.
2. SSB-SC Modulator and Demodultor (Phase ShiftMethod).
3. Frequency Modulation and Demodulation.
4. Study of spectrum analyzer and analysis of AM, DSB-SC and FMSignals.
5. Sampling Theorem – Verification.
6. Pulse Position Modulation&Demodulation.
7. Frequency Division Multiplexing.
8. Pulse Code Modulation: Generation andDetection.
9. Differential Pulse Code ModulationGeneration andDetection.
10. DeltaModulation: Generation and Detection.
11. Generation and Detection of Amplitude ShiftKeying.
12. Generation and Detection of Frequency ShiftKeying.
13. Generation and Detection of Differential Phase ShiftKeying.
14. Generation and Detection of Quadrature Phase ShiftKeying.

Equipment required

1. CRO - 0-20 M Hz
2. FunctionGenerators - 0-1M Hz
3. Multimeters
4. Lab Experimental Kits
5. Spectrum Analyzer - (0 -1GHz)

Course Outcomes

At the end of the course the student will be able to:

1. Verify the concepts of various analog modulation and demodulation methods in practice.
2. Demonstrate the study of spectrumanalyzer.
3. Conduct experiments on various Digital modulationtechniques
4. Convert the Analog signal to digital data using PCM, DPCM & DM.
5. Verify the concepts of various digital modulation and demodulation methods in practice.

(A30416) DIGITAL SIGNAL PROCESSING LAB

B. Tech. (ECE) V-Semester

L	T	P	C
0	0	3	1.5

Note:

- Minimum of 12 experiments are to be conducted.
- The programs shall be implanted in software (using MATLAB / LAB VIEW / C programming /OCTAVE or Equivalent) and hardware (Using TI / Analog devices / Motorola / Equipment DSP processors).

List of Experiments

1. Generation of Sinusoidal waveform / signal based on recursive difference equations.
2. To find DFT/IDFT of given DT signal
3. To find frequency response of a given system given in (Transfer Function / Differential equation form).
4. Implementation of FFT of given sequence
5. Determination of Power Spectrum of a given signal(s).
6. Implementation of LP FIR filters for a given sequence.
7. Implementation of HP FIR filters for a given sequence.
8. Implementation of LP IIR filters for a given sequence.
9. Implementation of HP IIR filters for a given sequence.
10. Generation of Sinusoidal signal through filtering
11. Implementation of Decimation Process.
12. Implementation of Interpolation Process.
13. Implementation of I/D sampling rate converters.
14. Impulse response of first order systems.
15. Impulse response of second order systems.

Course Outcomes:

At the end of the course the student will be able to:

1. 1Examine Time, Frequency and Z- transform analysis on signals and systems.
2. Apply z-transform, DTFT, DFT and FFT to analyze and design DSP systems.
3. Analyze and Observe Magnitude and phase characteristics (Frequency response Characteristics) of digital filters.
4. Evaluate the impulse response of first order and second order systems
5. Predict the Multi-rate filters for various applications of DSP.

(A30003) ADVANCED ENGLISH COMMUNICATION SKILLS LAB

B. Tech. (ECE) V-Semester

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES

This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.

INTRODUCTION

The introduction of the English Language Lab is considered essential at 3rd year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

UNIT-I: Functional English: Starting a conversation, responding appropriately and relevantly, using the right body language, Role play in Different Situations.

UNIT-II: Vocabulary Building: Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrasal verbs.

UNIT-III: Group Discussion: Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.

UNIT-IV: Interview Skills: Concept and process, pre-interview planning, opening strategies, answering strategies, Interview through tale and video- conferencing.

UNIT-V: Resume`and Technical Report Writing: Structure and presentation, planning, defining the career objective, projecting ones strengths and skill-sets, summary, formats and styles, Letter-writing. **Reading Comprehension**: Reading for facts, guessing meanings from context, scanning, skimming, inferring meaning and critical reading.

Course Outcomes:

1. Explain the rules of formal and informal situational dialogues and develop verbal & non-verbal communication skills.
2. Build academic vocabulary, use a variety of accurate sentence structures and utilize digital literacy tools to develop writing and grammar skills.
3. Express thoughts with clarity and hold discussions with everyone to develop analytical thinking.
4. Develop the skills required for attending different types of interviews.
5. Illustrate the report writing and summarize the main ideas of report; apply key elements of structure and style in drafting loner documents and read an incrasing range of texts well.

VI SEMESTER
(A30419) MICROWAVE ENGINEERING

B. Tech. (ECE) VI-Semester

L	T	P	C
3	0	0	3

Unit- I
Microwave Transmission Lines
Introduction to Microwaves, Microwave Spectrum and Bands, Applications of Microwaves, Types of Microwave Transmission lines.
Rectangular Waveguides- Solution of Wave Equations in Rectangular Coordinates, TE and TM mode analysis, Expressions for Fields, Cut-off Frequencies, Dominant and Degenerate Modes, - Phase and Group Velocities, Wavelengths and Impedance Relations, Power Losses and Maximum Power transmission, Impossibility of TEM Mode.
Micro Strip Lines- Introduction, Z_o Relations, Effective Dielectric Constant, Losses and Q factor.
Rectangular Waveguide Cavity Resonators-Introduction, Wave equations, Dominant Mode and Resonant Frequency, Q-factor and Illustrative Problems.

Unit- II
Waveguide Components and Applications: Coupling Mechanisms - Probe, Loop, - Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators -Different Types, Resistive Card and Rotary Vane Attenuators; Waveguide Phase Shifters - Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions–'E' plane and 'H' plane Tees, Magic Tee. Directional Couplers-2Hole, Bethe Hole types. Illustrative Problems.
Ferrites- Composition and Characteristics, Faraday rotation; Ferrite Components- Gyrator, Isolator, Circulator.
Scattering Matrix- Significance, S Matrix Properties, Calculation of S Matrix for- Gyrator, Isolator, E plane Tee and H plane Tee, Magic Tee, Circulator.

Unit- III

Microwave Tubes: Limitations and Losses of conventional tubes at microwave frequencies, Classification of O-type and M type Microwave tubes.

2-Cavity Klystrons- Structure, Re-entrant Cavities, Velocity Modulation Process, Applegate Diagram, Bunching Process and Small Signal Theory-Expressions for Output Power, efficiency and illustrated problems.

Reflex Klystrons-Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes and output Characteristics, Effect of Repeller Voltage on Power output. Illustrative Problems.

Unit- IV

Helix TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations, Applications.

M-Type Tubes: Introduction, Cross-field effects, Magnetrons-Different Types, Cylindrical Travelling Wave Magnetron -Hull Cut-off and Hartree Conditions, Modes of Resonance and π Mode Operation, Separation of π -Mode, Frequency Pulling, Frequency pushing, output characteristics. Illustrative Problems.

UNIT-V:

Microwave Solid State Devices: Introduction, Classification, Applications. TEDs - Introduction, Gunn Diodes-Principle, RWH Theory, Characteristics, Basic Modes of Operation - Gunn Oscillation Modes, LSA Mode, Introduction to Avalanche Transit Time Devices.

Microwave Measurements: Description of Microwave Bench-Different Blocks and their Features, Errors and Precautions; Microwave Power Measurement - Bolometers. Measurement of Attenuation, Frequency and Standing Wave Measurements-Measurement of Low and High VSWR, Cavity Q and Impedance Measurements.

Text Books:

1. Microwave Devices and Circuits- Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Microwave Engineering- Dr. M. Sudhakar, VandanaKhare, S Chand Publications, 1stEditon, 2016

Reference Books:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Principles - Herbert J.Reich, J.G. Skolnik, PF. Ordung and H.L.Krauss, CBS Publishers and Distributors, New Delhi, 2004.
3. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.
4. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
5. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th ed., 1955.
6. Micro Wave and Radar Engineering – M. Kulkarni, Umesh Publications, 1998

Course Outcomes:

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

1. Expalin about the advantages and applications of microwave frequencies and analyze the functioning of wave guides and cavity resonators
2. Explain the operation of various waveguide components and calculate their S Parameters
3. Analyze the operation of two cavity and reflex klystron and calculate their maximum efficiency
4. Analyze the operation of Helix TWT and Magnetron.
5. Explain the functioning of various microwave solid state devices and measure various microwave parameters using microwave test bench.

(A30420) VLSI DESIGN

B. Tech. (ECE) VI-Semester

L	T	P	C
3	0	0	3

Unit- I:

Introduction: Review of Semiconductors, Introduction to IC Technology, PMOS, NMOS, CMOS &BiCMOS technologies, Steps involved in Fabrication Process.

Basic Electrical Properties: Basic Electrical Properties of MOS and Bi CMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, Trans-conductance, figure of merit, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

Unit- II:

VLSI Circuit Design Processes: VLSI Design Flow, Design Constraints, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 um CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling, CAD tools

Unit- III:

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Basic circuit concepts, Concept of Sheet Resistance and Area Capacitance, Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out, Choice of layers.

Unit- IV:

System Level Design Considerations: ALU unit, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters, High Density Memory Elements. SRAM, DRAM, ROM, Serial access memories, Content Addressable Memory.

Unit- V:

Programmable logic Devices: PLD’s, CPLD’s, FPGAs, Standard Cells, sea of gates, Design Approach, Parameters influencing low power design.

CMOS Testing: Need and importance of testing, CMOS Testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

Textbooks:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, EshraghianDougles and A. Pucknell, PHI.
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil.H.E.Westea,David Harris,AyanBanerjee,3rd Ed, Pearson Education, 2009.

References:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective - Ming-BO Lin, CRC Press, 2011
2. VLSI Technology SM SZE.
3. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
4. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
5. VLSI Design- K .Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.
6. Introduction to VLSI - Mead & Convey, BS Publications, 2010.

Course Outcomes

At the end of the course the student will be able to:

1. Explain fabrication process of transistors, their electrical properties and design inverter with various pull-ups.
2. Explain about VLSI design flow and generate layouts for various circuits using layout design rules.
3. Explain different switching logics, alternate gates and estimate their time delays.
4. Design system level logic circuits using memory elements.
5. Design logic modules using PLA, PAL, FPGA and CPLD and explain different VLSI testing techniques to validate their functionality.

(A30421) MICROPROCESSORS & MICROCONTROLLERS

B. Tech. (ECE) VI-Semester

L	T	P	C
3	0	0	3

Unit- I: 8086 Architecture

8086 Architecture-Functional diagram, Register organization, Memory segmentation, programming model, Memory addresses, physical memory organization, Architecture of 8086, signal descriptions of 8086-Common Function Signals, Timing diagrams, Interrupts of 8086.

Unit- II: Instruction set and assembly language programming of 8086

Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, simple Programs involving Logical, Branch and Call Instructions, Sorting, Evaluating Arithmetic Expressions, String Manipulations.

Unit- III: I/O interface

8255 PPI, Various Modes of Operation and Interfacing to 8086, Interfacing keyboard, Display, D/A and A/D Converter.

Interfacing with advanced devices: Memory interfacing to 8086, Interrupt Structure of 8086, Vector interrupt table, Interrupt service routine.

Communication Interface: Serial Communication Standards, Serial Data Transfer Schemes, 8251 USART Architecture and Interfacing.

Unit – IV: Introduction to Microcontrollers

Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051, Simple Programs.

Unit – V: 8051 Real Time Control

Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters.

Text Books:

1. D.V. Hall, Micro Processors and Interfacing, TMGH, 2nd edition 2006.
2. Kenneth.J.Ayala,The 8051 Microcontroller, 3rd Ed, Cengage Learning.
3. The 8051 microcontroller and Embedded Systems, Muhammad Ali Mazidi and Janice GillispieMazidi, Second Edition, Pearson Education India

Reference Books:

1. Advanced microprocessor and Peripherals - A.K.Ray and K.M.Bhurchandi, TMH, 2nd edition 2006.
2. The 8051 Microcontrollers, Architecture and programming and Applications- K.Uma Rao, AndhePallavi, Pearson, 2009.
3. Micro Computer System 8086/8088 Family Architecture, Programming and Design - By Liu and GA Gibson, PHI, 2nd Ed.
4. Microcontrollers and Application, Aijay.V. Deshmukh, TMGH, 2005.
5. The 8085 Microprocessor: Architecture, Programming and interfacing- K. Uday Kumar, B.S.Umashankar, 2008, Pearson.

Course Outcomes

At the end of the course the student will be able to:

1. Describe the architecture of 8086 microprocessor.
2. Define various addressing modes, assembler directives and assembly level instructions of 8086 microprocessor.
3. Write assembly language programs for interfacing various I/O devices and 8251 USART with 8086 microprocessor.
4. Describe the architecture of 8051 microcontroller.
5. Write assembly language programs for various 8051 interrupts.

(A30443) DIGITAL IMAGE PROCESSING
(Professional Elective-II)

B. Tech. (ECE) VI-Semester

L	T	P	C
3	0	0	3

Unit- I: Digital Image Fundamentals
Digital Image fundamentals, Components of Digital Image Processing, Sampling andQuantization, Relationship between pixels.
Image Transforms: 2-D FFT, Properties, Walsh transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform and Hoteling Transform.

Unit-II: Image Enhancement (Spatial Domain)
Introduction, Image Enhancement in Spatial domain, Enhancement through point processing, Types of point processing, Histogram manipulation, Linear and nonlinear gray level Transformation, Local or neighbourhoodcriterion, Median filter, Spatial domain High-pass filtering.
Image Enhancement (Frequency Domain)
Filtering in Frequency domain, Low pass (Smoothing) and High pass (Sharpening) filters in frequency domain.

Unit- III: Image Restoration
Degradation model, Algebraic approach to restoration, Inverse filtering, least mean square filters, Constrained Least Squares Restoration, Interactive Restoration.

Unit- IV: Image Segmentation
Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation.
Morphological Image Processing: Dilation and Erosion; Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, The Hit or Miss Transformation.

Unit- V: Image Compression
Redundancies and their removal methods, Fidelity criteria, Image compression models, Huffman and Arithmetic Coding, Error free compression, Lossy compression, Lossy and Lossless Predictive Coding, Transform based Compression, JPEG 2000 Standards.

Text Books:

1. Digital Image Processing – Rafael C. Gonzalez, Rechard E. Woods, 3rd edition. Pearson, 2008
2. Digital Image Processing – S. Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010

Reference Books:

1. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E woods and Steven L. Eddings, 2nd Edition, TMH, 2010.
2. Fundamentals of Digital Image Processing – A. K. Jain, PHI, 1989.
3. Digital Image processing and Computer vision – Somka, Hlavac, Boyle Cengage learning (Indian edition) 2008.
4. Introductory Computer vision Imaging Techniques and Solutions – Adrian low, 2008, 2nd Edition.
5. Introduction to Image Processing & Analysis – John C. Russ, J. Christian Russ, CRC press, 2010.

Course Outcomes

At the end of the course the student will be able to:

1. Describe the fundamental concepts of digital image processing and trasformation techniques.
2. Explain the image enhancement techniques in spatial and frequency domain
3. Explain degradation technique and restoration techniques for image reconstruction.
4. Describe various image segmentation methods and morphological methods.
5. Analyze various Lossy and Lossless image compression techniques.

(A30444) CELLULAR & MOBILE COMMUNICATIONS
(Professional Elective -II)

B. Tech. (ECE) VI-Semester

L	T	P	C
3	0	0	3

Unit - I:

Introduction to Cellular Mobile Radio Systems: Limitations of conventional telephone systems, Basic cellular mobile systems, first, second, third and fourth generation cellular wireless systems, Uniqueness of mobile radio environment- Fading-Time dispersion parameters, coherence bandwidth, Doppler spread and coherence time.

Fundamentals of Cellular Radio System Design: Concept of Frequency Reuse, Co- Channel Interference, Co-Channel Interference Reduction Factor, Desired C/ I from a Normal Case in an Omni Directional Antenna System, System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems – Cell Splitting, Sectoring, Microcell Zone Concept.

Unit - II: Co–Channel Interference: Measurement of real time Co–Channel Interference, Design of Antenna System, Antenna Parameters and their Effects, Diversity Techniques–Space Diversity, Polarization Diversity, Frequency Diversity and Time Diversity.

Non–Co–Channel Interference: Adjacent Channel Interference, near end far end interference, Cross talk, Effects on coverage and interference by power decrease, Antenna height decrease, Effects of cell site components.

Unit - III:

Cell Coverage for Signal and Traffic: Signal reflection in flat and hilly terrain, Effect of human made structures, Phase difference between direct and reflected paths. Constant standard deviation, Straight line path loss slope, General formula for mobile propagation over water and flat open area, Near and long distance propagation, Path loss from a point to point prediction model in different conditions merits of Lee model.

Cell Site and Mobile Antennas: Space diversity antennas, Umbrella pattern antennas, and Minimum separation of cell site antennas, mobile antennas.

Unit - IV:

Frequency Management and Channel Assignment: Numbering and grouping, Set up access and paging channels, Channel assignments to cell sites and mobile UNITs, Channel sharing and borrowing, Sectorization, Overlaid cells, channel assignment.

Unit - V:

Handoffs and Dropped Calls: Handoff initiation, Types of handoff, Delaying handoff, Advantages of handoff, Power difference handoff, Forced handoff, Mobile assisted and soft handoff, Intersystem handoff, Introduction to dropped call rates and their evaluation.

Text Books:

1. Mobile Cellular Telecommunications – W. C. Y. Lee, McGraw Hill, 2ndEdn.. 1989.
2. Wireless Communications – Theodore, S. Rapport, Pearson education. 2ndedn.. 2002.
3. Mobile Cellular Communication – GottapuSashiBhushana Rao, Pearson, 2012.

Reference Books:

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International, 2ndedn... 2001.
2. Modern Wireless Communications – Simon Haykin, Michael Mohar, Perason Education, 2005.
3. Wireless Communications Theory and Techniques – Asrar U. H. Sheikh, Springer, 2004.
4. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.
5. Wireless Communications – Andrea Goldsmith, Cambridge University Press, 2005.

Course Outcomes

At the end of the course the student will be able to:

1. Illustrate the impairments due to multi path fading channel.
2. Interpret the fundamental techniques to overcome the different fading effects.
3. Describe the co-channel, non-co-channel interferences.
4. Demonstrate the cell coverage for signal, traffic and cell cite antennas.
5. Distinguish the frequency management, channel assignment and types of handoff.

(A30516) OPERATING SYSTEMS
(Professional Elective-II)

B. Tech. (ECE) VI-Semester

L	T	P	C
3	0	0	3

UNIT-I

Operating System Introduction, Structures - Simple Batch, Multi-programmed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls.

UNIT –II

Process and CPU Scheduling- Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads, and Interposes Communication, Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System call interface for process management-fork, exit, wait, waitpid, exec

UNIT –III

Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

Process Management and Synchronization- The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, Critical Regions, Monitors. Inter process Communication Mechanisms: IPC between processes on a single computer system, IPCbetween processes on different systems, using pipes, FIFOs, message queues, shared memory.

UNIT –IV

Memory Management and Virtual Memory- Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

UNIT -V

File System Interface and Operations-Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. usage of open, create, read, write, close, lseek, stat, ioctl, system calls

Text Books:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne7th Edition, John Wiley
2. Advanced programming in the Unix environment, W.R. Stevens, Pearson education.

Reference Books:

1. Operating Systems – Internals and Design Principles, Stallings, 5th Edition, Pearson Education/PHI,2005.
2. Operating System A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum 2nd edition, Pearson/PHI.
4. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
5. Unix Internals the New Frontiers, U. Vahalia, Pearson Education.

Course Outcomes

Students shall be able to

1. Describe the components of computer and their respective roles in computing.
2. Explain process concepts and CPU Scheduling Algorithms.
3. Demonstrate the Mutual exclusion, deadlock detection and Inter Process Communications.
4. Analyze various memory management and allocation methods.
5. Discuss File System Interface and Operations.

(A30013) BUSINESS MANAGEMENT & FINANCIAL ANALYSIS

B. Tech. (ECE) VI-Semester

L	T	P	C
4	0	0	4

UNIT – I Introduction of Management Concepts: Concept, Origin, Growth, Nature, Characteristics, Scope and Principles of Management. Functions of Management: Planning, Organizing, Staffing, Directing, Coordinating, Reporting and Budgeting. Scientific Management- FW Taylor Contributions to Management Modern Management- Henry Fayol Contributions to Management Human Relations Approach to Management: Theories of Motivation and Leadership.

UNIT – II Functional areas of Management: Production Management: Systems of Production, PPC functions & Plant Layout. Financial Management: Objectives, Goals, & Functions of Financial Management. Marketing Management: Recent Trends in Marketing & Marketing Mix. Human Resources Management: Nature, Objectives, Scope & Functions of HR Management.

UNIT – III Introduction to Managerial Economics & Business Environment: Definition, Nature, Scope and Functions Managerial Economics, Difference between Micro & Macro Economics Internal & External Scanning of Business Environment, Importance of National Income, Inflation, Deflation, Stagflation, Business Cycle & Product Life Cycle Concepts. Concept & Law of Demand, Factors Influencing and Limitations. Concept of Elasticity of Demand, Types of Elasticity, Methods of Measuring Elasticity. Introduction to Demand Forecasting, Objectives, Scope, Types and Methods.

UNIT –IV Theory of Production, Cost, Price & Markets: Production Function, Assumptions, Limitations & Types Cost Concepts, Cost-Output Relationship, Break Even Analysis Assumptions, Limitations & Applications (Simple Problems). Theory of Pricing, Objectives, Situations & Types. Introductions Markets, Demand-Supply Schedule for Equilibrium Price, Nature & Types of Competition.

UNIT – V Introduction to Financial Statement Analysis: Types & Objectives of Business Enterprises, Conventional & Non-Conventional Sources of Financing Business Enterprise. Identification of Financial

Statement Formats-Manufacturing A/c, Trading A/c, Profit & Loss A/c, Balance Sheet. Techniques of Analyzing Financial Statements: Analysis & Interpretation through Liquidity, Leverage, Coverage, Activity, Turnover, Profitability Ratios-Simple Problems on Liquidity, Leverage and Activity Ratios.

Text Books:

1. Varshney, Maheswari (2003), Managerial Economics, Sultan Chand, New Delhi,India.
2. Stoner, Freeman, Gilbert, Management, 6th Ed, Pearson Education, New Delhi, 2004.

Reference Books:

1. Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2005
2. Koontz &Weihrich: Essentials of Management, 6/e, TMH, 2005 Thomas N.Duening& John M.Ivancevich Management—Principles and Guidelines, Biztantra, 2003.
3. Ambrish Gupta (2004), Financial Accounting for Management, Pearson Education, New Delhi, India.
4. Domnick Salvatore (2011), Managerial Economics in a Global Economy, 7th edition, Oxford University Press, United States of America.
5. Narayanaswamy (2005), Financial Accounting, A Managerial Perspective, Prentice Hall of India private Ltd, New Delhi, India.
6. Aryasri (2005), Managerial Economics and Financial Analysis, 2nd edition, Tata McGraw Hill, New Delhi, India

Course Outcomes

At the end of the course the student will be able to:

1. Describe the components of computer and their respective roles in computing.
2. Explain process concepts and CPU Scheduling Algorithms.
3. Demonstrate the Mutual exclusion, deadlock detection and Inter Process Communications.
4. Analyze various memory management and allocation methods.
5. Discuss File System Interface and Operations.

(A30014) ENVIRONMENTAL SCIENCES

B. Tech. (ECE) VI-Semester

L	T	P	C
2	0	0	0

Student will be able to

- Develop an understanding of the necessity of protection of environment
- Develop an understanding of Natural resources
- Develop an understanding of Biodiversity
- Develop an understanding of Global Environmental problems
- Develop an understanding of Environmental pollution

UNIT-I

Environmental Studies:

Introduction, Definition, scope and importance, Ecosystems: Introduction, types, characteristic features, structure and functions of ecosystems. Bio geo chemical cycle, Classification of Eco system.

UNIT-II

Natural Resources: Classification of Resources, Land resources, Land as resource, Common property resources, Land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer – pesticide problems, Forest resources, Use and over-exploitation.

Mining and dams – their effects on forest and tribal people, Water resources, Use and over- utilization of surface and groundwater, Floods, droughts, Water logging and salinity, Dams –benefits and costs, Conflicts over Water, Energy resources.

UNIT-III

Bio-diversity and its conservation, Value of bio-diversity -consumptive and productive use, social, ethical, aesthetic and option values, Bio-geographical classification of India – India as a mega diversity habitat, Threats to bio-diversity –Hot-spots, habitat loss, poaching of wild life, loss of species, seeds, etc. Conservation of bio-diversity – Insitu and Ex-situ conservation.

UNIT-IV

Environmental Pollution –Local and Global Issues, Nature of thermal pollution and nuclear hazards, Global warming, Acid rain, Ozone depletion. Environmental case studies.

UNIT-V

Environmental Problems in India, Drinking water, sanitation and public health, Effects of the activities on the quality of environment, Water scarcity and groundwater depletion, Controversies on major dams – resettlement and rehabilitation of people: problems and concerns, Rain water harvesting, cloud seeding and watershed management. Economy and Environment, The economy and environment interaction, Economics of development, preservation and conservation, Sustainability: theory and practices, Limits to growth, Equitableuse of resources for sustainable life styles, Environmental Impact Assessment.

Text Books

1. Environmental Science - Y. Anjaneyulu, B S Publications.
2. Environmental studies-Deekshadave, Cengage learning India Pvt. Ltd.,
3. Environmental sciences and Engineering - P. Venugopal Rao, PHI learning Pvt. Ltd.,
4. Environmental Science and Technology by M. Anji Reddy, B S Publications.

Reference Books

1. Clark, R.S., Marine Pollution, Clanderson Press, Oxford, 2002.
2. Cunningham, W.P., et al. Environmental Encyclopedia, Jaico Publishing House, Mumbai, 2003.

Course Outcomes:

On successful completion of this course, it is expected that students should be able to

1. Acquire the knowledge on environment
2. Acquire the knowledge of various Natural Resources
3. Develop skills in understanding of various environmental problems
4. Develop skills to protect the Environment
5. To understand various environmental issues in India

(A30556) CYBER SECURITY
(Common to all branches)

B. Tech. (ECE) VI-Semester

L	T	P	C
2	0	0	0

Unit-I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIATriad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

Unit-II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

Unit-III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Unit-IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Unit-V

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

TEXT BOOK:

1.Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes, ComputerForensics and Legal Perspectives, Wiley

2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

2. Introduction to Cyber Security, Chwan-Hwa(john) Wu, J. David Irwin, CRC Press T&F Group.

Course Outcomes

After completion of this course, the students shall be able to:

1. Understand, appreciate, employ, design and implement appropriate security technologies and policies to protect computers and digital information.
2. Identify & Evaluate Information Security threats and vulnerabilities in Information Systems and apply security measures to real time scenarios.
3. Identify common trade-offs and compromises that are made in the design and development process of Information Systems.
4. Demonstrate the use of standards and cyber laws to enhance information security in the development process and infrastructure protection.
5. Evaluate the mindset and skills of hackers and able to apply data privacy policies and their specifications.

(A30422) MICROPROCESSORS & MICROCONTROLLERS LAB

B. Tech. (ECE) VI-Semester

L	T	P	C
0	0	3	1.5

Note: Minimum of 12 experiments are to be conducted.

List of Experiments

The following programs /experiments are to be executed in Microsoft Macro assembler and also in 8086 and 8051 kits.

1. Program for 16 bit arithmetic operations for 8086 (using Various Addressing Modes).
2. Program for sorting an array for 8086.
3. Program for searching a number or character in a string for 8086.
4. Program for string manipulations in 8086.
5. Program for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086
7. **Parallel communication between two microprocessors using 8255.**
8. **Serial communication between two microprocessors using 8251.**
9. Interfacing to 8086 and Programming to control stepper motor.
10. Program using arithmetic, logical and bit manipulation instructions of 8051.
11. Program and verify Timer/Counter in 8051.
12. Program and verify interrupt handling in 8051.
13. UART Operation in 8051.
14. **Communication between 8051 kit and PC.**
15. Interfacing LCD to 8051.
16. Interfacing matrix/keyboard to 8051.
17. Data transfer from Peripheral to memory through DMA controller 8237/8257.

Course Outcomes

At the end of the course the student will be able to:

1. Apply the programming knowledge on microprocessor and microcontroller
2. Design the assembly level language program's for various applications
3. Analyze the interfacing of 8086 microprocessor with peripherals

4. Compare different implementations and designing with interfacing circuits
5. **5.** Choose the appropriate programming level for a specified application.

(A30423) MICROWAVE ENGINEERING LAB

B. Tech. (ECE) VI-Semester

L	T	P	C
0	0	3	1.5

Minimum of 12 Experiments should be conducted

All the experiments are to be realized in hardware.

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Directional Coupler Characteristics.
4. Measurement of Impedance of a given load.
5. Measurement of scattering parameters of a E plane Tee.
6. Measurement of scattering parameters of a H plane Tee.
7. Measurement of scattering parameters of a Magic Tee.
8. Measurement of scattering parameters of a Circulator.
9. Attenuation Measurement.
10. Microwave Frequency measurement.
11. VSWR characteristics.
12. Study of Digital Optic Fiber link.
13. Laser diode characteristics.
14. To measure the gain of a waveguide horn antenna.
15. LED characteristics.

Equipment required for Microwave Engineering Lab

1. Microwave Bench set up with Klystron Power Supply
2. Microwave Bench set up with Gunn Power Supply
3. Micro Ammeter
4. VSWR meter
5. Microwave Components
6. CRO - 0-20 M Hz
7. Function Generators - 0-1M Hz
8. Multimeters

Course Outcomes:

At the end of the course, the student will be able to:

1. Study the characteristics of various microwave Tubes.
2. Analyze the various parameters of microwave devices.
3. Distinguish between H plane, E plane and Magic Tee.
4. Examine Isolation, Coupling factor and Directivity of directional couplers.
5. Study the characteristics of Digital Optic Fiber & Laser.

(A30424) IC APPLICATIONS & VLSI LAB

B. Tech. (ECE) VI-Semester

L	T	P	C
0	0	3	1.5

(Minimum of 4 Experiments to be conducted in each part)

PART -A: IC Applications

1. Adder, Subtractor& comparator using IC741 Opamp
2. Integrator & Differentiator using IC741 Opamp
3. 2nd Order Active low pass & High pass Butterworth Filter
4. RC Phase Shift &Wein Bridge Oscillator using IC741 Opamp
5. IC555 Timer in Monostable and Astable multivibrator Circuits.
6. Voltage Regulators – IC723, 3 Terminal voltage regulators 7805, 7809, 7812, 7905. 7909, 7912.

PART - B: DIGITAL DESIGN

Write Verilog Code for the following circuits and their Test Bench for verification, observe the waveform and synthesize the code with technological library with given constraints*. Do the initial timing verification with gate level simulation.

1. An inverter
2. A Buffer
3. Basic/universal gates
4. Flip flop -RS, D, JK, MS, T
5. Serial & Parallel adder
6. 4-bit counter [Synchronous and Asynchronous counter]
7. Successive approximation register [SAR]

PART - C ANALOG DESIGN

1. Design an Inverter with given specifications**, completing the design flow mentioned below:

a. Draw the schematic and verify the following

i) DC Analysis

ii) Transient Analysis
b. Draw the Layout and verify the DRC, ERC
c. Check for LVS
d. Extract RC and back annotate the same and verify the Design
e. Verify & Optimize for Time, Power and Area to the given constraint*

2. Design the
(i) Common source and Common Drain amplifier and
(ii) A Single Stage differential amplifier, with given specifications**, completing the design flow mentioned below:
a. Draw the schematic and verify the following
i) DC Analysis
ii) AC Analysis
iii) Transient Analysis
b. Draw the Layout and verify the DRC, ERC
c. Check for LVS
d. Extract RC and back annotate the same and verify the Design.
3. Design an op-amp with given specification** using given differential amplifier Common source and Common Drain amplifier in library*** and completing the design flow mentioned below:
a. Draw the schematic and verify the following
i) DC Analysis
ii). AC Analysis
iii) Transient Analysis
b. Draw the Layout and verify the DRC, ERC
c. Check for LVS
d. Extract RC and back annotate the same and verify the Design.
4. Design a 4 bit R-2R based DAC for the given specification and completing the design flow mentioned using given op-amp in the library***.
a. Draw the schematic and verify the following
i) DC Analysis
ii) AC Analysis
iii) Transient Analysis
b. Draw the Layout and verify the DRC, ERC

5. For the SAR based ADC mentioned in the figure below draw the mixed signal schematic and verify the functionality by completing ASIC Design FLOW. [Specifications to GDS-II] * An appropriate constraint should be given. ** Appropriate specification should be

given. *** Applicable Library should be added & information should be given to the Designer.

Course Outcomes:

1. Examine the different applications of Op-Amp.
2. Explain the characteristics of Voltage regulators using different ICs.
3. Verify different combinational circuits using Verilog HDL.
4. Verify different sequential circuits using Verilog HDL.
5. Analyze the various circuits using cadence tool.

VII SEMESTER

(A30514) COMPUTER NETWORKS

B. Tech. (ECE) VII-Semester

L	T	P	C
3	0	0	3

UNIT -I

Introduction: Network hardware, Network software, OSI, TCP/IP Reference models, Example Networks: ARPANET, Internet.

Physical Layer: Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wirelesstransmission.

UNIT –II

Data link layer: Design issues, framing, Error detection and correction.

Elementary data link protocols: simplex protocol, A simplex stop and wait protocol for an error-freechannel, A simplex stop and wait protocol for noisy channel.

Sliding Window protocols: A one-bit sliding window protocol, A protocol using Go-Back-N, A protocolusing Selective Repeat, Example data link protocols.

Medium Access sub layer: The channel allocation problem, Multiple access protocols: ALOHA, Carriersense multiple access protocols, collision free protocols. Wireless LANs, Data link layer switching.

UNIT –III

Network Layer: Design issues, Routing algorithms: shortest path routing, Flooding, Hierarchical routing, Broadcast, Multicast, distance vector routing, Congestion Control Algorithms, Quality of Service, Internetworking, The Network layer in the internet.

UNIT –IV

Transport Layer: Transport Services, Elements of Transport protocols, Connection management, TCP andUDP protocols.

UNIT -V

Application Layer–Domain name system, SNMP, Electronic Mail; the World WEB, HTTP, Streamingaudio and video.

Text Books:

1. Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, 5th Edition. Pearson Education/PHI

Reference Books:
1. An Engineering Approach to Computer Networks, S.Keshav, 2nd Edition, Pearson Education
2. Data Communications and Networking – Behrouz A. Forouzan. 3rd Edition, TMH.

Course Outcomes

The student shall be able

1. Distinguish each layer in OSI and TCP/IP model and define the types of transmission media with real time applications.
2. Determine the design issues of data link layer and its protocols.
3. Classify the routing protocols and analyze the assigning of the IP addresses for the given network.
4. Illustrate the Transport layer services and explain TCP and UDP protocols.
5. Explain the functions of Application layer Protocols.

(A30445) MICROWAVE ANTENNAS
(Professional Elective -III)

B. Tech. (ECE) VII-Semester

L	T	P	C
3	0	0	3

UNIT-I

Fundamental parameters and definitions for antennas, Theories of radiation, Image theory, Schelkunoff's equivalence theorem, Huygens' principle, Babinet's principle.

UNIT-II

Radiation from rectangular and circular apertures, design considerations, Fourier transforms method in aperture antenna theory. Broadband antennas: Log periodic and Spiral antennas.

UNIT-III

Linear arrays: Uniform and Non uniform amplitude distribution, Planar arrays, Smart antenna methods, Smart antenna Algorithms, Synthesis of antenna arrays using Schelkun off polynomial method, Fourier transform method and Woodward-Lawson method.

UNIT-IV

Printed antennas: Rectangular and circular patch antenna design, Feeding techniques for micro strip antennas, Methods of analysis, Printed antenna arrays, Bandwidth enhancement techniques.

UNIT-V

Introduction to Meta materials, EBG Structures and Frequency Selective Surfaces, Survey of Commercially available EM Simulation Software.

Text Books:

1. Constantine Balanis, Modern Antenna Handbook, John wiley, 2008.
2. Stutzman, W.L. and Thiele, H.A., "Antenna Theory and Design", 2nd Ed., John Wiley & Sons.

Reference Books:

1. Bahl IJ, and Bhartia, Microstrip Antennas, Artech House, 1982.
2. D.G.Fang,Antenna Theory and Microstrip Antennas, CRC press 2010.
3. James.JR.HallPS.wood.C., Micro strip Antenna-Theory and Design, Peter Peregrinu.1981.

Course Outcomes:

At the end of the course, the student will be able to:

1. Define basic definitions related to antennas and radiation mechanism of different antennas.
2. Explain rectangular and circular aperture antennas and its design considerations.
3. Explain various linear arrays with respect to their radiation mechanism and related parameters.
4. Explain various printed antennas with respect to their radiation mechanism and related parameters.
5. Examine various materials used in antenna fabrications and also overview on EM simulation softwares.

(A30446) OPTICAL COMMUNICATIONS
(Professional Elective -III)

B. Tech. (ECE) VII-Semester

L	T	P	C
3	0	0	3

Unit- I

Overview of Optical Fiber Communication: Historical development, The general system, Advantages of Optical Fiber Communications, Optical Fiber Wave Guides: Introduction, Ray Theory Transmission, Total Internal Reflection, Acceptance Angle, Numerical Aperture, Skew Rays, Cylindrical Fibers, Modes, V number, Mode Coupling, Step Index Fiber, Graded Index Fiber.
Single mode fibers: Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Fiber materials, Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers.

Unit-II

Signal Distortion in Optical Fibers: Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity Determination, Group delay, Types of Dispersion: Material Dispersion, Wave Guide Dispersion, Polarization Mode Dispersion, Intermodal Dispersion, Pulse Broadening. Optical Fiber Connectors: Connector Types, Single Mode Fiber Connectors, Connector Return Loss.

Unit-III

Fiber Splicing: Splicing techniques, Splicing Single Mode Fibers. Fiber Alignment and Joint Loss: Multimode Fiber Joints, Single Mode Fiber Joints, Optical Sources: LEDs, Structures, Materials, Quantum Efficiency, Power, Modulation, Power Bandwidth Product, Injection Laser Diodes: Modes, Threshold Conditions, External Quantum Efficiency, Laser Diode Rate Equations, Resonant Frequencies. Reliability of LED& ILD.
Source to Fiber Power Launching: Output Patterns, Power Coupling, Power Launching, Equilibrium Numerical Aperture, Laser Diode to Fiber Coupling.

Unit-IV

Optical Detectors: Physical Principles of PIN and APD, Detector Response Time, Temperature Effect on Avalanche Gain, Comparison of Photo Detectors, Optical Receiver Operation: Fundamental Receiver Operation, Digital Signal Transmission, Error Sources, Receiver

Configuration, Digital Receiver Performance, Probability of Error, Quantum Limit, Analog Receivers.

Unit- V

Optical System Design: Considerations, Component Choice, Multiplexing, Point to Point Links, System Considerations, Link Power Budget with Examples, Overall Fiber Dispersion in Multi-Mode and Single Mode Fibers, Rise Time Budget with Examples.
Transmission Distance, Line Coding in Optical Links, WDM, Necessity, Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye Pattern.

Text Books:

1. Optical Fiber Communications – Gerd Keiser, TMH,4th Edition, 2008.
2. Optical Fiber Communications – John M. Senior, Pearson Education,3rd Edition, 2009.

Reference Books:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Text Book on Optical Fibre Communication and it's Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal, John Wiley, 3rd Ediition, 2004.
4. Introduction to Fiber optics by Donald j. Sterling Jr. -Cengage Learning, 2004.
5. Optical Communication Systems- John Gowar, 2nd Edition, PHI

Course Outcomes:

At the end of the course, the student will be able to:

1. Analyze the constructional parameters of optical fibers.
2. Discuss various connectors used for optical system.
3. Estimate the losses due to attenuation, absorption, scattering and bending.
4. Compare various optical detectors for different applications.
5. Design an optical system with the required link power budget.

(A30447) EMBEDDED SYSTEMS DESIGN
(Professional Elective -III)

B. Tech. (ECE) VII-Semester

L	T	P	C
3	0	0	3

Unit I: Introduction to Embedded Systems
Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Unit II: Typical Embedded System
Core of the Embedded System: General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off- The- Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: On-board and External Communication Interfaces.

Unit III: Embedded Firmware
Reset Circuit, Brown-out Protection Circuit, Oscillator UNIT, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

Unit IV: RTOS Based Embedded System Design
Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Unit V: Task Communication
Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization issues, Task Synchronization Techniques, Device Drivers, How to choose an RTOS.

Text Books:
1. Introduction to Embedded Systems – Shibu K.V. McGraw Hill
2. Embedded System Design – Frank Vahid, Tony Givargis, John Wiley

Reference Books:
1. Embedded Systems – Raj Kamal, TMH

2. Embedded Systems – Lyla, Pearson, 2013
3. An Embedded Software Primer- David E Simon, Pearson Education

Course Outcomes:

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

1. Discuss the concept of embedded systems and its applications.
2. Apply the knowledge of interfacing various types of memories, sensors and Input / Output devices to processor.
3. Explain the embedded firmware for design approaches.
4. Classify various types of Real time operating Systems.
5. Distinguish the task communication and task synchronization techniques.

(A30448) CPLD &FPGA ARCHITECTURES
(Professional Elective -IV)

B. Tech. (ECE) VII-Semester

L	T	P	C
3	0	0	3

UNIT – I Review of Logic Design and FPGA Design Flow
Review of Logic Design, Implementation with NAND – NOR gates, designing with multiplexers, implementation of logic functions with look-up tables, minimization of combinational functions, FPGA design flow.

UNIT – II Programmable Logic Devices
Programmable Logic: Introduction, programmable logic devices (PLDs), SPLDs, CPLDs, fundamentals of PLD circuits, PLD symbology, PLD architectures: Programmable Read Only Memories (PROMs), Programmable Array Logic (PAL), ALTERA CPLDs.

UNIT – III Field Programmable Gate Arrays
FPGAs: Introduction, Programming Technologies: SRAM, Antifuse, EPROM and EEPROM Xilinx FPGAs, XC3000, XC4000, Actel 1/2/3 FPGAs, Altera FLEX 8000/10000 FPGAs, Concurrent Logic FPGAs.

UNIT – IV: Logic Block Architecture
Logic Block functionality versus area-efficiency, Impact of Logic Block Functionality in FPGA performance, Routing for FPGAs: Segmented Channel Routing, Routing for Symmetrical FPGAs, CGE detailed router Algorithm. Flexibility of FPGA routing architectures: Logic Block, Connection Block, Trade-offs in Flexibilities of the S and C blocks, A theoretical model for FPGA routing.

UNIT – V System Level Design
Controller, data path and functional partitions, combinational and sequential circuit design, case study: Mealy & Moore machines.

Text Books:
1.Park K. Chan / SamihaMourad, “Digital Design using Field Programmable Gate Arrays”, Pearson, 1994
2.Ian Grout, “Digital Systems Design with FPGAs and CPLDs”, Elsevier, Newnes.

3.Stephen D. Brown, Robert J Francis, Jonathan Rose, Ivonko G. Vranesic, “Field Programmable Gate Arrays”, Springer International Edition, First Indian Print 2007
4.Wayne Wolf, “FPGA-based System Design”, Pearson Education, First Impression, 2009.

Reference Books:

1.Stephen M. Trimberger, “Field Programmable Gate Array Technology” Springer International Edition”, First Indian Reprint 2007.
2.Stephen Brown ZvonkoVranesic – Fundamentals of Digital Logic with VHDL design, McGraw Hill – 2000.

Course Outcomes

At the end of the course the student will be ableto:

1. Acquire Knowledge about various architectures and FPGA design flow
2. Explain and demonstrate FPGA Architectures.
3. Define FSM and Compare different FSM techniques.
4. Explain Logic Block Architecture and FPGA routing.
5. Analyze System level Design and their application for Combinational and Sequential Circuits

(A30449) RADAR SYSTEMS
(Professional Elective -IV)

B. Tech. (ECE) VII-Semester

L	T	P	C
3	0	0	3

Unit- I

Basic of Radar : Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Predication of range performance, Minimum Detectable Single, Receiver Noise, Modified Range Equation, Illustrative Problems.

Radar Equation :SNR, Envelope Detector – False Alarm Time and Probability Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment). Illustrative problems.

Unit -II

CW Radar: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problems.

FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW Altimeter, Limitations of single frequency FM-CW Radar, Multiple Frequency CW Radar.

Unit- III

MTI and Pulse Doppler Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance.

Unit- IV

Tracking Radar: Tracking with Radar, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse, Phase Comparison Monopulse. Tracking in Range, Acquisition and Scanning Patterns.

Unit V

Detection of Radar Signals in Noise: Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver

Radar Receivers – Noise Figure and Noise Temperature. Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts. Radiation Pattern, Beam Steering and Beam Width changes.

Text Books:

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd ed., 2007.
2. Radar: Principles, Technology. Application-Byron Edde , Pearson Education, 2004

Reference Books:

1. Radar Principles- Peebles, Jr., P.Z., Wiley, New York, 1998.
2. Principles of Modern Radar – Mark A, Richards, James A, Scitech 2010.

Course Outcomes

At the end of the course the student will be ableto:

1. Explain basics of Radar Systems, Radar Range and various terminologies.
2. Describe Continuous wave Radar and its applications.
3. Analyse operation of MTI Radar and applications.
4. Explain principle operation of tracking radar and different error determination methods.
5. Distinguish various sub systems used in Radars and describe filter Techniques.

(A30450) REAL TIME OPERATING SYSTEMS
(Professional Elective -IV)

B. Tech. (ECE) VII-Semester

L	T	P	C
3	0	0	3

Unit-I:
Introduction:
Introduction to Unix/Linux, Overview of Commands, File I/O (open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

Unit - II:
Real Time Operating Systems
Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, Tasks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency.
Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

Unit - III:
Objects, Services and I/O
Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/OConcepts, I/O Subsystem

Unit - IV:
Exceptions, Interrupts and Timers
Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

Unit - V:
Case Studies of RTOS
RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, Tiny OS, and Basic Concepts of Android OS.

Text books:
1. Real Time Concepts for Embedded Systems – Qing Li, Elsevier, 2011(3rd Edition).
2. Embedded Systems-Architecture, Programming and Design by Rajkamal, 2007, TMH.

Reference books:

1. Advanced Unix Programming, Richard Stevens
2. Embedded Linux: Hardware, Software and Interfacing – Dr. Craig Hollabaugh
3. Linux System Programming - Robertlove – 2nd Edition.

Course Outcomes:

At the end of the course, the student will be able to:

1. Explain the basic commands of UNIX/LINUX Operating Systems.
2. Illustrate the different operations and uses of real time operating systems.
3. Distinguish the Objects, Services and I/O of real time operating systems.
4. Summarize the Exceptions, Interrupts and Timers on real time operating systems.
5. Discover variousreal time operating systems for practical applications.

(A30451) LOW POWER VLSI DESIGN
(Professional Elective -V)

B. Tech. (ECE) VII-Semester

L	T	P	C
3	0	0	3

UNIT I:

Fundamentals: Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT II:

Low-Power Design Approaches: Low-Power Design through Voltage Scaling: VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches. Switched Capacitance Minimization Approaches: System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT III:

Low-Voltage Low-Power Adders: Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look-Ahead Adders, Carry Select Adders, Carry Save Adders, LowVoltage Low-Power Design Techniques –Trends of Technology and Power Supply Voltage, LowVoltage Low-Power Logic Styles.

UNIT IV:

Low-Voltage Low-Power Multipliers: Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh-Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

UNIT V:

Low-Voltage Low-Power Memories: Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, LowPower SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

TEXT BOOKS:

1. Sung-Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuits – Analysis and Design", TMH, 2011.
2. Kiat-Seng Yeo, Kaushik Roy, "Low-Voltage, Low-Power VLSI Subsystems", TMH Professional Engineering.

Reference books:

1. Ming-BO Lin, "Introduction to VLSI Systems: A Logic, Circuit and System Perspective", CRC Press
2. AnanthaChandrakasan, "Low Power CMOS Design", IEEE Press, /Wiley International, 1998.
3. Kaushik Roy, Sharat C. Prasad, "Low Power CMOS VLSI Circuit Design", John Wiley, & Sons, 2000.
4. Gary K. Yeap, "Practical Low Power Digital VLSI Design", Kluwer Academic Press, 2002.
5. Bellamour, M. I. Elamasri, "Low Power CMOS VLSI Circuit Design", A Kluwer Academic Press.
6. Siva G. Narendran, AnathaChandrakasan, "Leakage in Nanometer CMOS Technologies", Springer, 2005.

Course Outcomes:

At the end of the course the students are able to

1. Explain the various advanced issues in VLSI systems.
2. Understand the deep sub micron silicon technologies in CMOS.
3. Classify the CMOS digital design styles.
4. Analyze the battery operated power systems and high performance circuits.
5. Design the low power memories.

(A30452) SATELLITE COMMUNICATIONS
(Professional Elective -V)

B. Tech. (ECE) VII-Semester

L	T	P	C
3	0	0	3

Unit-I:

Communication Satellite: Orbit and Description: A brief History of Satellite Communication, Satellite Frequency bands, Satellite Systems, Applications, Orbital Period and Velocity, Effects of Orbital inclination, Azimuth and Elevation, Coverage and Slant range, Eclipse, Orbital perturbations, Placement of a Satellite in a Geo-Stationary Orbit.

Unit-II:

Satellite Sub-Systems: Attitude and orbit control system, TT&C Sub-System, Attitude control Sub-System, Power Systems, Communication Subsystems, Satellite antenna Equipment.

Satellite Link: Basic transmission theory, system noise temperature and G/T ratio, Basic Link Analysis, Interference Analysis, Design of satellite links for specified C/N, (with and without frequency Re-use), Link Budget.

Unit-III:

Propagation effects: Introduction, Atmospheric Absorption, Cloud Attenuation, Tropospheric and Ionospheric Scintillation and Low angle fading, Rain Induced attenuation, rain induced cross polarization interference.

Multiple Access: Frequency Division Multiple Access (FDMA), Intermodulation, Calculation of C/N. Time Division Multiple Access (TDMA), Frame structure, Burst structure, Satellite Switched TDMA On-board processing, Demand Assignment Multiple Access (DAMA) – Types of Demand Assignment, Characteristics, CDMA Spread Spectrum Transmission and Reception

Unit-IV:

Earth Station Technology: Transmitters, Receivers, Antennas, Tracking systems, Terrestrial Interface, Power Test methods, Lower Orbit Considerations.

Satellite Navigation & Global Positioning Systems: Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers, GPS C/A code accuracy, Differential GPS.

Unit-V:

Satellite Packet Communications: Message Transmission by FDMA: M/G/1 Queue, Message Transmission by TDMA, PURE ALOHA-Satellite Packet Switching, Slotted Aloha, Packet Reservation, Tree Algorithm.

Text Books:

1. Satellite Communications- Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003, John Wiley & Sons.
2. Satellite Communication Engineering- Wilbur L. Pritchand, Robert A Nelson and Henri G. Suyderhoud, 2nd Edition, Pearson Publications.
3. Digital Satellite Communications-Tri. T. Ha, 2nd Edition, 1990, Mc. Graw Hill.

Reference Books:

1. Satellite Communications- Dennis Roddy, 2nd Edition, 1996, McGraw Hill.
2. Satellite Communications: Design Principles- M. Richharia, 2ndEdition, BS Publications, 2003.
3. Digital Satellite Communications-Tri. T. Ha,2ndEd., MGH,1990.

Course Outcomes:

At the end of the course the students are able to

1. Understand the orbital mechanism and frequency allocation for satellite ommunication.
2. Analyze the Design of satellite link budget and discuss the satellite subsystems like telemetry, tracking and command systems.
3. Discuss the significance of propagation effects, different types of multiple access techniques in communication satellites.
4. Understand the earth station transmitters and receivers and analyze the concepts of satellite navigation and global positioning systems.
5. Evaluate the future communication systems and error control coding techniques for digital satellite links.

(A30455) BIOMEDICAL INSTRUMENTATION
(Professional Elective -V)

B. Tech. (ECE) VII-Semester

L	T	P	C
3	0	0	3

UNIT-I : COMPONENTS OF MEDICAL INSTRUMENTATION SYSTEM

Bioamplifier, Static and Dynamic Characteristics of Medical Instruments, Biosignals and Characteristics, Problems encountered with Measurements, from Human beings. organization of cell, Derivation of Nernst equation for Membrane Resting Potential Generation of Action Potential , Conduction through Never to Neuromuscular Junction.

UNIT-II : BIO ELECTRODES

Biopotential Electrodes –External Electrodes, Internal Electrodes, Biochemical Electrodes.Mechanical Function, Electrical Conduction System of the Heart, Cardiac Cycle, Relation between Electrical and Mechanical Activities of the Heart.

UNIT-III : CARDIAC INSTRUMENTATION

Blood Pressure and Blood Flow Measurement, Specification of ECG Machine, Einthoven Triangle , Standard 12-Lead Configurations, Interpretation of ECG waveform with respect to Electro Mechanical Activity of the Heart.

UNIT-IV :

Therapeutic Equipment Pacemaker , Defibrillator, Shortwave Diathermy, Hemodialysis Machine. Respiratory Instrumentation: Mechanism of Respiration, Spirometry, Pnemuotachograph Ventilators.

UNIT-V

Neuro – Muscular Instrumentation: Specification of EEG and EMG Machines, Electrode
Placement for EEG and EMG Recording, Interpretation of EEG and EMG.

TEXT BOOKS:

1. Biomedical Instrumentation and Measurements- by Leslie Cromwell, F.J. Weibell, E.A.
Pfeiffer, PHI

3. Medical Instrumentation, Application and Design – by John G.Webster, John Wiley.

REFERENCE BOOKS:

1. Principles of Applied Biomedical Instrumentation – by L.A.Geoddes and L.E.Baker, John
Wiley and Sons
2. Hand-book of Biomedical Instrumentation- by R.S.Khandpur, McGraw-Hill,2003
3. Biomedical Telemetry – by Mackay, Stuart R., John Wiley.

Course Outcomes:

At the end of the course, the student will be able to:

1. Explain various components of biomedical instrumentation system.
2. Classify various bioelectrodes and activities of heart.
3. Analyse the ECG waveform.
4. Explain respiration mechanism and its instrumentation.
5. Analyse EEG and EMG recordings for disorder identification.

VIII SEMESTER

(A30453) WIRELESS COMMUNICATION NETWORKS

(Professional Elective -VI)

B. Tech. (ECE) VIII-Semester

L	T	P	C
3	0	0	3

UNIT- I: THE CELLULAR CONCEPT-SYSTEM DESIGN FUNDAMENTALS

Introduction, Frequency reuse, channel assignment strategies. Handoff Strategies-Prioritizing Handoffs, Practical Handoff considerations, Interference and system capacity-Co channel Interference and system capacity, Channel planning for wireless Systems, Adjacent Channel interference, Power control for Reducing interference, Trunking and grade off service, improving coverage & capacity in Cellular Systems-cell splitting,

UNIT- II: MOBILE RADIO PROPAGATION: LARGE-SCALE PATH LOSS

Introduction to Radio wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle Reflection from perfect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnet Zone Geometry, Knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ry Tracing and Site Specific Modeling.

UNIT- III: MOBILE RADIO PROPAGATION: SMALL- SCALE FADING AND MULTIPATH

Small Scale Multipath propagation –Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel-Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence

Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat Fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading,slow fading, Stastical Models for multipath Fading Channels-Clarke's model for flat fading,spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statstics, Two-ray Rayleigh Fading Model.

UNIT – IV: EQUALIZATION AND DIVERSITY

Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non-linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT –V: WIRELESS NETWORKS

Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, HiperLan, WLL.

TEXT BOOKS:

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Mobile Cellular Communication – GottapuSasibhushana Rao, Pearson Education, 2012.

REFERENCE BOOKS:

1. Principles of wireless Networks - KavehPahLaven and P. Krishnamurthy, 2002, PE.
2. Wireless Digital Communications – KamiloFeher, 1999, PHI.

3. Wireless Communication and Networking – William Stallings, 2003,PHI
4. Wireless Communication - UpenDalal, Oxford Univ. Press.
5. Wireless Communications and Networking – Vijay K. Gary, Elsevier.

Course Outcomes:

At the end of the course the student will be able to:

1. Understand the Cellular Concept and principles of Wireless Communications.
2. Analyze various methods for finding large scale path loss.
3. Analyze various models for finding small scale fading.
4. Explain different equalization and diversity techniques.
5. Classify various wireless standards in wireless networks.

(A30454) DIGITAL SIGNAL PROCESSORS & ARCHITECTURES
(Professional Elective -VI)

B. Tech. (ECE) VIII-Semester

L	T	P	C
3	0	0	3

Unit-I:

Review of Digital Signal Processing: Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D conversion errors, DSP computational errors, D/A conversion Errors, Compensating filter.

Unit-II:

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation UNIT, Programmability and Program Execution, Speed Issues, Features for External Interfacing.

Unit-III:

Programmable Digital Signal Processors: Commercial Digital signal processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Unit-IV:

Analog Devices Family of DSP Devices: Analog devices family of dsp devices- ALU and MAC Block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance processor.

Introduction to Blackfin Processor- TheBlackfin Processor, Introduction to Micro signal Architecture, Overview of Hardware processing UNITs and Register files, Address Arithmetic UNIT, Control UNIT, Bus Architecture and Memory, Basic peripherals.

Unit-V:

Interfacing Memory and I/O Peripherals to Programmable DSPDevices:

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

Text Books:

1. Digital Signal Processing-Avtar Singh and S.Srinivasan, Thomson Publications, 2004
2. A Practical Approach to Digital Signal Processing- K. Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009.
3. Embedded Signal Processing with the Micro Signal Architecture Publisher: Woon- SengGan, Sen M. Kuo, Wiley-IEEE Press, 2007

References:

1. Digital Signal Processors, Architecture, Programming and Applications- B. VenkataRamani and M. Bhaskar, 2002, TMH.
2. Digital Signal Processing- Jonatham Stein, 2005, John Wiley.
3. DSP Processor Fundamentals, Architectures & Features- Lapsleyetal.S.Chand& Co.
4. Digital Signal Processing Applications Using the ADSP-2010 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Army Mar, PHI

Course Outcomes

At the end of the course the student will be ableto:

1. Determine FFT and DFT of a given sequence and distinguish various errors in digital signal processing.
2. Explain the DSP computational building blocks.
3. Demonstrate the architecture and addressing modes of TMS320C54XX series DSP Processor.
4. Describe the architecture of ADSP2100 DSP Processor and The BLACKFIN Processor.
5. Explain Interfacing memory, I/O devices and DMA controller for programmable DSP devices.

(A30456) ARTIFICIAL NEURAL NETWORKS
(Professional Elective -VI)

B. Tech. (ECE) VIII-Semester

L	T	P	C
3	0	0	3

UNIT - I

Introduction to neural networks: Human brain and models of a neuron, artificial neurons and activation functions

Learning processes: Introduction to Supervised, Unsupervised and Reinforcement Learning, Memory-based learning, Hebbian learning, competitive learning, Boltzman learning, Adaptive Linear Neuron

UNIT - II

Single-layer Perceptrons: Unconstrained optimization, LMS algorithm, learning curves, perceptrons, convergence theorem, limitations of single-layer perceptrons, Relation between Perceptron and Bayes Classifier for a Gaussian Environment

Multi-layer perceptrons: Back-propagation algorithm, XOR problem, feature detection, accelerated convergence of back-propagation algorithm, limitations

UNIT – III

Radial Basis function networks: Theorems on separability of patterns, interpolation problem, regularization theory and regularization networks, generalized RBF, approximation properties of RBF, comparison of RBF and back-propagation, Limitations ofBack Propagation Learning

UNIT – IV

Associative Memory Networks: Training Algorithm for Pattern Association-Hebb Rule, Bidirectional Associative Memory

Self- Organizing maps(SOM): Feature mapping models, SOM algorithm, learning vector quantization, adaptive vector quantization

UNIT - V

Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm

Hopfield Models – Hopfield Models, Hamming Networks

TEXT BOOKS:

1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.
1. Mohamad H. Hassoun: Fundamentals of Artificial Neural Networks(PHI)

REFERENCE BOOKS:

1. ArtificialNeuralNetworksB.YegnanarayanaPrenticeHallofIndiaPLtd 2005
2. Neural Networks in Computer Inteligance, Li Min Fu TMH2003
3. Neural Networks -James A Freeman David M SKapura Pearson Education 2004.
4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed.2006.

Course Outcomes:

By completing this course the student will be able to:

1. Create the mathematical foundations of neural network models.
2. Design and implement neural network systems to solve real world problems.
3. Apply the knowledge of radial basis functions in neural networks using various learning rules.
4. Develop various algorithms and mapping models for associate memory networks and SOM.
5. Distinguish various systems for neuro dynamics and hopfield models.

(A30554) JAVA PROGRAMMING
(OPEN ELECTIVE)

B. Tech (ECE)	L	T	P	C
	3	0	0	3

UNIT-I

Introduction: Java Essentials, JVM, Java Features, Creation and Execution of Programs, Data Types, Type Conversion, Casting, Conditional Statements, Loops, Branching Mechanism, Classes, Objects, Class Declaration, Creating Objects, Method Declaration and Invocation, Method Overloading, Constructors– Parameterized Constructors, Constructor Overloading, Cleaning-up unused Objects, Class Variables & Methods-static Keyword, this Keyword.

UNIT–II

Arrays: One-Dimensional Arrays, Two-Dimensional Arrays, Command-Line Arguments, Inner Class. **Inheritance**: Introduction, Types of Inheritance, extends Keyword, Examples, Method Overriding, super, final Keywords, Abstract classes, Interfaces, Abstract Classes Verses Interfaces.

UNIT–III

Packages–Creating and Using Packages, Access Protection, Wrapper Classes, String Class, StringBuffer Class. **Exception**: Introduction, Types, Exception Handling Techniques, User-Defined Exception.

UNIT-IV

Multithreading: Introduction, Main Thread, Creation of New Threads – By Inheriting the Thread Class or Implementing the Runnable Interface, Thread Lifecycle, Thread Priority, Synchronization.

UNIT–V

java.io Package, File Class, FileInputStream Class, FileOutputStream Class, Scanner Class, BufferedInputStream Class, BufferedOutputStream Class, RandomAccessFile Class.

Text Books:

1.Sachin Malhotra, Saurabh Choudhary, Programming in Java (2e), Oxford publications.

Reference Books:

1.Herbert Schildt, Java: The Complete Reference (9e), McGraw Hill Education;

2. C. Thomas Wu, An introduction to object-oriented programming with Java (5e), McGraw-Hill Education;

Course Outcomes

The student shall be able to:

1. Explain the OOPs concepts.
2. Describe various types of Inheritance in Java.
3. Develop robust Java applications using Packages, Exceptions.
4. Implement Java applications using Java Threads.
5. Design Java applications with various modes of Input and Output.

****END****

(A30531) PYTHON PROGRAMMING
(OPEN ELECTIVE)

B. Tech (ECE)

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Python, Installing Python. How a Program Works, Using Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.
Data types and Expressions: Strings, Assignment and Comments, Numeric Data Types and Character Sets, Expressions, Functions and Modules.

UNIT–II

Control Statements: Definite Iteration, Formatting Text for Output, Selection, Conditional Iteration. File and Exceptions: Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions. Functions: Introduction, Defining and Calling a Void Function, designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions-Generating Random Numbers, the math Module, Storing Functions in Modules.

UNIT–III

Python Data structures: Accessing Characters and Substrings in a String, Strings and Number System, String Methods, Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings. Text Files, Data Encryption, Lists, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples Sequences, Tuples. Dictionaries and Sets:

Dictionaries, Sets, Serializing Objects. Recursion: Introduction, Problem Solving with Recursion, Examples of Recursive Algorithms

UNIT-IV

Design with Classes: Classes and Objects, Classes and Functions, Classes and Methods, Working with Instances, Inheritance and Polymorphism. Object-Oriented Programming: Procedural and Object-Oriented Programming, Classes, techniques for Designing Classes

UNIT–V

Graphical User Interfaces: Behavior of terminal based programs and GUI-based programs, Coding simple GUI-based programs, other useful GUI resources. GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

Simple Graphics and Image Processing: Overview of Turtle Graphics, Two dimensional Shapes, Colors and RBG System, Image Processing.

Text Books:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011,
Cengage Learning.
2. Think Python First Edition, by Allen B. Downey, Orielly publishing

Reference Books:

1. Introduction to Computation and Programming Using Python. John V.
Guttag, The MIT Press.
2. James Payne, Beginning Python using Python 2.6 and Python 3, Wrox
publishing
3. Paul Gries, Practical Programming: An Introduction to Computer Science using Python 3, The Pragmatic Bookshelf, 2nd edition

Course Outcomes

Students shall be able to

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Express different Decision-Making statements and Functions
3. Interpret Object oriented programming in Python
4. summarize different File handling operations
5. Explain how to design GUI Applications in Python and evaluate different database Operations.

****END****

(A30555) INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS
(OPEN ELECTIVE)

B. Tech (ECE)	L	T	P	C
	3	0	0	3

UNIT-I

Introduction to Databases: Introduction, Traditional File-Based Systems, Database Approach, Roles in the Database Environment, Advantages and Disadvantages of DBMS, The Three-Level ANSI-SPARC Architecture, Database Languages, Data Models, Functions of a DBMS, Components of DBMS. Relational Model: Introduction, Terminology, Integrity Constraints, Views. The Relational Algebra: Unary Operations, Set Operations, Join Operations, Division Operation, Aggregation and Grouping Operations.

UNIT–II

SQL: The ISO SQL Data Types, Integrity Enhancement Feature– Domain Constraints, Entity Integrity, Referential Integrity, General Constraints, Data Definition–Creating a Database, creating a Table, Changing a Table Definition, removing a Table, Creating an Index, Removing an Index, Views–Creating a View, Removing a View, View Resolution, Restrictions on Views, View Updatability 'WITH CHECK OPTION', Advantages and Disadvantages of Views, View Materialization.

UNIT–III

SQL: Introduction, Data Manipulation–Simple Queries, Sorting Results, Using the SQL Aggregate Functions, Grouping Results, Sub-queries, ANY and ALL, Multi-table Queries, EXISTS and NOT EXIST, Combining Result Tables, Database Updates.

UNIT-IV

Advanced SQL: The SQL Programming Language–Declarations, Assignments, Control Statements, Exceptions, Cursors, Subprograms, Stored Procedures, Functions, and Packages, Triggers, Recursion.

UNIT–V

Normalization: The Purpose of Normalization, How Normalization Supports Database Design, Data Redundancy and Update Anomalies, Functional Dependencies in brief, The Process of Normalization,1NF, 2NF, 3NF, BCNF.

TEXT BOOKS:

1.Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw-Hill Education, 2003

2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw-Hill Education

REFERENCE BOOKS:

1.Thomas M. Connolly, Carolyn E. Begg, Database Systems–A Practical Approach to Design, Implementation, and Management (6e), Pearson publisher

2. RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson publisher

Course Outcomes

Students shall be able to

1. Describe Database Management System Architecture.
2. Create, update, and modify Relational Database Objects.
3. Manipulate data in Relational Database.
4. Develop PL/SQL programs using Cursors, Subprograms, Stored procedures, Functions, and Packages, Triggers.
5. Explain the purpose of normalization and types Normal forms.

****END****

(A30537) DATA ANALYTICS WITH R
(OPEN ELECTIVE)

B. Tech (ECE)

L	T	P	C
3	0	0	3

UNIT -I

Introduction, how to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes. R Programming Structures, Control Statements, Loops, - Looping Over Non-Vector Sets, - If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion

UNIT –II

Introduction of Data Science, Basic Data Analytics using R, R Graphical User Interfaces Data Import and Export, Attribute and Data Types, Descriptive Statistics, Exploratory Data Analysis, Visualization Before Analysis, Dirty Data, visualizing a Single Variable, Examining Multiple Variables, Data Exploration Versus Presentation

UNIT –III

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability- Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains

UNIT –IV

Discover R‘s packages to do graphics and create own data visualizations. Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function ,Customizing Graphs, Saving Graphs to Files. Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests, ANOVA

Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression- other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines- Decision- Random Forests,

UNIT –V

Overview of Clustering, K-means, Use Cases, Overview of the Method, Perform K-means Analysis using R. Classification, Decision Trees, Overview of a Decision Tree, Decision Tree Algorithms, Evaluating a Decision Tree. Decision Tree in R, Bayes 'Theorem, Naïve Bayes Classifier, Smoothing, Naïve Bayes in R

Text Books:

1. The Art of R Programming, Norman Matloff, Cengage Learning
2. David Dietrich, Barry Heller and Beibei Yang, ―Data Science and Big Data
   Analytics: Discovering, Analyzing, Visualizing and Presenting Data‖, EMC
   Education Services,

Reference Books:

1. R in Action, Rob Kabacoff, Manning Nathan Marz, James Warren, ―Big Data-
   Principles and best practices of scalable real-time data systems‖, Edition 2015, DreamTech Press,

Course Outcomes

The student shall be able

1. Explain data science concepts.
2. Explore data and analyze it using R.
3. Implement classification, clustering and feature selection methods with R.
4. Understand Regression Generalized Linear Models.
5. Perform K-means Analysis using R.

****END****

(A30557) WEB PROGRAMMING (OPEN ELECTIVE)

B. Tech (ECE)	L	T	P	C
	3	0	0	3

Unit-I

Structuring Documents for the Web: Introducing HTML and XHTML, Basic Text Formatting, Presentational Elements, Phrase Elements, Lists, Editing Text, Core Elements and Attributes, Attribute Groups Links and Navigation: Basic Links, Creating Links with the **< a>** Element, Advanced E- mail Links. Images, Audio, and Video: Adding Images Using the **<img>** Element, Using Images as Links Image Maps, Choosing the Right Image Format, Adding Flash, Video and Audio to your web pages. Tables: Introducing Tables, Grouping Section of a Table, Nested Tables, Accessing Tables Forms: Introducing Forms, Form Controls, Sending Form Data to the Server Frames: Introducing Frameset, <frame>Element, Creating Links Between Frames, Setting a Default Target Frame Using **<base>**Element, Nested Framesets, Inline or Floating Frames with **<iframe>**. Changing font size, color using of text using <font> Element, scrolling text/image using <marquee> Element

Unit-II

Cascading Style Sheets: Introducing CSS, where you can Add CSS Rules. **CSS Properties**: Controlling Text, Text Formatting, Text Pseudo Classes, Selectors, Lengths, Introducing the Box Model. **More Cascading Style Sheets:** Links, Lists, Tables, Outlines, the: focus and: activate Pseudo classes Generated Content, Miscellaneous Properties, Additional Rules, Positioning and Layout with CSS, **Page Layout**: Understating the Site's Audience, Page Size, Designing Pages, coding your Design, Developing for Mobile Devices. **Design Issues:** Typography, Navigation, Tables, Forms.

Unit-III

Learning JavaScript: How to Add Script to Your Pages, the Document Object Model, Variables, Operators, Functions, Control Statements, Looping, Events, Built- In Objects, Working with JavaScript: Practical Tips for Writing Scripts, Form Validation, Form Enhancements, JavaScript Libraries. Putting Your site on the web:

Meta tags, testing your site, Taking the Leap to Live, Telling the World about your site, Understanding your visitors.

Unit-IV

XML - Introduction, XML Basics, Structuring Data, XML Namespaces, Document Type Definitions (DTDs), W3C XML Schema Documents, XML Vocabularies, Extensible Style sheet Language and XSL Transformations, Document Object Model (DOM).

Unit-V

Ajax-Enabled Rich Internet Applications: introduction, history of Ajax, traditional web applications Vs Ajax Applications, RIAs with Ajax, Ajax example using XML HttpRequest object, XML and DOM, creating full scale Ajax-enabled application, Dojo Toolkit.

TEXT BOOK:

1. Jon Duckett, Beginning HTML, XTML, CSS and JavaScript
2. Dietel and Dietel : "Internet and World Wide Web - How to Program", 5th Edition, PHI/Pearson Education, 2011.

REFERENCE BOOKS:

1. Chris Bates, Web Programming
2. M. Srinivasan, Web Technology: Theory and Practice
3. Achyut S. Godbole, AtulKahate, Web Technologies
4. Kogent Learning Solutions Inc, Web Technologies Black Book
5. Ralph Moseley and M. T. Savaliya, Developing Web Applications

Course Outcomes

Students shall be able to

1. Write well-structured, easily maintained, standards-compliant, accessible HTML code.
2. Write well-structured, easily maintained, standards-compliant CSS code to present HTML pages in different way
3. Use JavaScript to add dynamic content to pages.
4. Effectively debug JavaScript code, making use of good practice and debugging tools.
5. Use JavaScript to access and use web services for dynamic content (AJAX, JSON, etc.)

(A30542) CLOUD COMPUTING
(OPEN ELECTIVE)

B. Tech (ECE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT -I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT –II

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

UNIT –III

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT –IV

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

UNIT –V

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue, service, Microsoft, Windows

Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform.

Text Books:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

Reference Books:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011.

Course Outcomes

The student shall be able to

1. Explain Distributed System Modeling, Clustering and Virtualization
2. Discuss basic concepts of cloud computing.
3. Distinguish Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS/SAAS).
4. Design & implement cloud computing applications.
5. Explore some important cloud computing driven commercial systems.

****END****

(A30538) DEEP LEARNING
(OPEN ELECTIVE)

B. Tech (ECE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT -I

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

UNIT –II

Regularization for Deep Learning Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier.

UNIT –III

Optimization for Training Deep Models:

How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT –IV

Convolutional Networks

The Convolution Operation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks, Convolutional Networks and the History of Deep Learning.

UNIT –V

Applications: Large-Scale Deep Learning, Computer Vision, Speech recognition, Natural Language Processing, Other Applications.

TEXT BOOKS:

1. Deep Learning, Ian Goodfellow, YoshuaBengio and Aaron Courville, In
Preparation for MIT Press.
2. Artificial Neural Networks. Yegnanarayana, Prentice- Hall of India, 1999

REFERENCE BOOKS:

1. Neural Networks and Learning Machines. Haykin, Prentice Hall of India, 2010
2. Pattern Recognition and Machine Learning, C.M. Bishop, Springer, 2006

Course Outcomes

The students shall be able to

1. Explain Deep Feed-forward networks, Gradient-Based learning.
2. Describe regularization techniques for Deep learning.
3. Differentiate learning and optimization in Deep learning.
4. State the significance of Convolutional Networks.
5. State the applications of Deep Learning.

****END****

(A30559) INTRODUCTION TO DATA SCIENCE (OPEN ELECTIVE)

B. Tech (ECE)	L	T	P	C
	3	0	0	3

Unit-I

Introduction to Data Science: Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting.

Introduction to Programming Tools for Data Science: Toolkits using Python- Matplotlib, NumPy, Scikit-learn, NLTK.

Unit-II

Visualizing Data- Bar Charts, Line Charts, Scatterplots. **Working with data-** Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction

Unit-III

Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression- model assumptions, regularization (lasso, ridge, elastic net), **Classification and Regression algorithms-** Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM).

Unit-IV

Decision trees, and random forest, Classification Errors, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks- Learning & Generalization, Overview of Deep Learning.

Unit-V

Case Studies of Data Science Application: Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis.

TEXT BOOK:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media

2. AurélienGéron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media

3. Jain V.K., “Data Sciences”, Khanna Publishing House, Delhi.
4. Jain V.K., “Big Data and Hadoop”, Khanna Publishing House, Delhi.
5. Jeeva Jose, “Machine Learning”, Khanna Publishing House, Delhi.

REFERENCE BOOKS:

1. Chopra Rajiv, “Machine Learning”, Khanna Publishing House, Delhi.
2. Ian Goodfellow, YoshuaBengio and Aaron Courville, "Deep Learning", MIT Presshttp://www.deeplearningbook.org
3. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, MorganKaufmann Publishers

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

1. Demonstrate understanding of the mathematical foundations needed for data science.
2. Collect, explore, clean, munge and manipulate data.
3. Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering.
4. Analyze Time series Data.
5. Build data science applications using Python based toolkits.

END

(A30471) PRINCIPLES OF ELECTRONIC COMMUNICATIONS
(Open Elective)

B. Tech. (ECE)

L	T	P	C
3	0	0	3

Unit- I: Introduction to Communication System

Block diagram of Communication system, Radio communication: Types of communications, Analog, Pulse, and Digital, Types of Signals, Fourier Transform for various signals, Fourier Spectrum, Power spectral density, Correlation, Convolution, Time Division Multiplexing, Frequency Division Multiplexing.

Unit- II: Amplitude Modulation

Need for modulation, Types of Amplitude modulation: AM, DSBSC, SSBSC, Power and BW requirements, Generation of AM, DSBSC, SSBSC, Demodulation of AM: Diode detector, Coherent detection of DSBSC& SSBSC.

Unit- III: Angle Modulation

Frequency & Phase Modulation, Advantages of FM over AM, Bandwidth consideration, Narrow band FM, Wide band FM, Comparison of FM and PM.

Pulse Modulation

Sampling, Sampling Theorem for Band limited signals, Types of Pulse modulation: PAM, PWM, PPM, Generation and demodulation of PAM, PWM, and PPM.

Unit- IV: Digital communication

Advantage, Block diagram of PCM, Quantization error, DPCM, Adaptive DPCM, DM and Comparison.

Digital Modulation: ASK, FSK, PSK, DPSK, QPSK, coherent and Non-coherent reception.

Unit- V: Information Theory

Concept of Information, Rate of Information and entropy, Source coding for optimum rate of information, Coding efficiency, Shannon Fano coding, Huffman Coding.

Error Control Coding: Introduction, Error detection and Correction codes, Block codes, Convolution codes.

Textbooks:

1. Communication Systems Analog and Digital–R. P. Singh, SD Sapre, TMH, 20th reprint, 2004.
2. Principles of Communication Systems – H Taub& D. Schilling, GautamSahe, TMH, 3rd Edition, 2007.
3. Communication Systems – B.P. Lathi, BS Publication, 2004.

References:

1. Analog and Digital Communication – K. Sam Shanmugam, Willey, 2005.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Digital Communications- John G. Proakis, MasoudSalehi- 5th Edition, Mcgarw- Hill,2008.

Course Outcomes

At the end of the course the student should be able to:

1. Explain the concept of Communication systems.
2. Distinguish the concept of AM and FM transmission and Reception.
3. Analyze the concepts of digital communication systems.
4. Compare the different digital modulation techniques.
5. Discuss about different error detecting and error correcting codes like block codes, cyclic codes and convolution codes.

(A30472) BASIC ELECTRONICS ENGINEERING
(Open Elective)

B. Tech. (ECE)

L	T	P	C
3	0	0	3

UNIT-I:
P-N Junction Diode:
Basics of semiconductor materials, P-N junction as a Diode, Diode Equation, Volt-Ampere Characteristics, Temperature dependence of V-I characteristics, Ideal versus Practical- Resistance levels (Static and Dynamic). Breakdown Mechanisms in Semiconductor Diodes, Zener Diode Characteristics, Voltage Regulation using Zener diode.

UNIT- II:
Rectifiers and Filters:
The P-N junction as a Rectifier, Half wave Rectifier, Full wave Rectifier, Bridge Rectifier, Harmonic components in a Rectifier Circuit, Inductor Filters, Capacitor Filters, L- Section Filters, Pi-Section Filters, Comparison of Filters.

UNIT –III:
Bipolar Junction Transistor:
The Junction Transistor, , Transistor Current Components, , Transistor as an Amplifier, transistor Construction, BJT Operation, symbol, Common base, Common Emitter and Common Collector Configurations, Limits of operation, BJT Specifications, BJT Hybrid model , Determination of H parameters from Transistor characteristics, Comparison of CB, CE, and CC configurations.

UNIT- IV:
Transistor Biasing and Stabilization: Operating Point, The DC and AC Load lines, Need for Biasing, Fixed Bias, Collector to base bias Feedback, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against variations in V_{BE} and β, Bias Compensation using Diodes and Transistors, Thermal Runaway, Thermal Stability.

UNIT- V:
Field Effect Transistor: The Junction Field Effect Transistor (Construction, principle of operation, Symbol)- Pinch-off Voltage-Volt-Ampere characteristics, The JFET small signal model, MOSFET

(Construction, principle of operation, Symbol), MOSFET Characteristics in Enhancement and Depletion modes.

TEXT BOOKS:

1. Millman's Electronic Devices & Circuits-J. Millman, C.C. Halkais&SatyabrataJit, 2 Ed., 1998, TMH.
2. Electronic Devices & Circuits- Mohammad Rashid, Cengage Learning, 2013
3. Electronic Devices & Circuits- David A. Bell, 5 Ed, Oxford

REFERENCE BOOKS:

1. Integrated Electronics- J. Millman and Christos C. Halkais, 1991 Ed., 2008, TMH.
2. Electronic Devices and Circuits- R.L. Boylstad and Louis Nashelsky, 9 Ed., 2006, PEI/PHI
3. Electronic Devices and Circuits- B. P. Singh, Rekha Singh, Pearson, 2 Ed, 2013.
4. Electronic Devices and Circuits- K. Lal Kishore, 2 Ed., 2005, BSP.
5. Electronic Devices and Circuits- Anil K. Maini, Varsha Agarwal, 1 Ed., 2009, Wiley India Pvt Ltd.
6. Electronic Devices and Circuits- S. Salivahanan, N. Suresh Kumar, A. Vallavaraj, 2 ed., 2008, TMH.

Course outcomes:

At the end of the course the student will be able to:

1. Classify different types of diodes and its characteristics.
2. Explain various rectifiers and filters.
3. Analyze the characteristics of BJT & FET.
4. Design the DC bias circuitry of BJT and explain its stability.
5. Distinguish and explain the characteristics of various FET Amplifiers.

(A30473) IMAGE PROCESSING
(Open Elective)

B.TechECE

L	T	P	C
3	0	0	3

Unit- I: Digital Image Fundamentals
Digital Image fundamentals, Components of Digital Image Processing, Sampling andQuantization, Relationship between pixels.
Image Transforms: 2-D FFT, Properties, Walsh transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform.

Unit-II: Image Enhancement (Spatial Domain)
Introduction, Image Enhancement in Spatial domain, Enhancement through point operation, Types of point operation, Histogram manipulation, Linear and nonlinear gray level Transformation, Local or neighborhood operation, Median filter, image Smoothing & Sharpening
Image Enhancement (Frequency Domain)
Filtering in Frequency domain, obtaining frequency domain filters from spatial filters, generating filters directly in the frequency domain, image Smoothing&Sharpening.

Unit- III: Image Restoration
Degradation model, Algebraic approach to restoration, Inverse filtering, least mean square filters, Constrained Least Squares Restoration.

Unit- IV: Image Segmentation
Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation.
Morphological Image Processing: Dilation and Erosion, Structuring Element Decomposition, Opening and Closing, the Hit or Miss Transformation.

Unit- V: Image Compression
Redundancies and their removal methods, Fidelity criteria, Image compression models, Huffman and Arithmetic Coding, Error free compression, Lossy compression, Lossy and Lossless Predictive Coding, Transform based Compression, JPEG 2000 Standards.

Text Books:

1. Digital Image Processing – Rafael C. Gonzalez, Rechard E. Woods, 3rd edition. Pearson, 2008

2. Digital Image Processing – S. Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010

Reference Books:

1. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E woods and Steven L. Eddings, 2nd Edition, TMH, 2010.

2. Fundamentals of Digital Image Processing – A. K. Jain, PHI, 1989.

3. Digital Image processing and Computer vision – Somka, Hlavac, Boyle Cengage learning (Indian edition) 2008.

4. Introductory Computer vision Imaging Techniques and Solutions – Adrian low, 2008, 2nd Edition.

5. Introduction to Image Processing & Analysis – John C. Russ, J. Christian Russ, CRC press, 2010.

Course outcomes

At the end of the course the student will be able to:

1. Describe the fundamental concepts of digital image processing and trasformation techniques.
2. Explain the image enhancement techniques in spatial and frequency domain
3. Explain degradation technique and restoration techniques for image reconstruction.
4. Describe various image segmentation methods and morphological methods.
5. Analyze various Lossy and Lossless image compression techniques.

(A30474) DIGITAL ELECTRONICS
(Open Elective)

B.Tech. ECE

L	T	P	C
3	0	0	3

UNIT I:
NUMBER SYSTEM AND BOOLEAN ALGEBRA AND SWITCHING FUNCTIONS
Number Systems, Base Conversion Methods, Complements of numbers, Codes – binary codes, Binary Coded Decimal code and its properties, unit Distance Codes, Alpha Numeric Codes, Error Detecting and Correcting Codes.
Boolean Algebra: Basic theorems and properties - Switching Functions, Canonical and Standard forms - Algebraic simplification Digital Logic Gates, Properties of XOR gates &Universal gates - Multilevel NAND/NOR realizations.

UNIT-II:
MINIMIZATION AND DESIGN OF COMBINATIONAL CIRCUITS:
Introduction, The Minimization methods with Theorem, The Karnaugh Map Method, Five and Six Variable Maps, Prime and Essential Implicants, Don't Care Map Entries, Minimization using tabular method, Partially Specified Expressions Multi Output minimization and combinational design, ArithmeticCircuits, Comparator, Multiplexer, Code-converters.

UNIT-III:
FUNDAMENTALSOF SEQUENTIAL MACHINES
Introduction, Basic Architectural Distinctions between combinational and sequential circuits. The Binary Cell, Fundamentals of Sequential Machine Operations, The Flip-flop, D-Latch &Flip-flop, the clocked T-flip-flop, the clocked J-K flip-flop, Design of a clocked flip-flop. Conversion from one type of Flip-Flop to another, Timing and Triggering Consideration.

UNIT-IV:
SEQUENTIAL CIRCUIT DESIGN AND ANALYSIS
Introduction, State Diagram, Analysis of synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite

State Machines, Design Aspects, State Reduction, Design Steps, Realization using Flip-Flops.
Counters –Design of single mode counter, Ripple counter, Ring counter, Shift register, Shift register sequences, Ring counter using Shift register.

UNIT-V:
FSM Charts: Finitestate machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and Merger chart methods-concept of minimal cover table.

TEXT BOOKS:
1. Switching& Finite Automata theory – ZviKohavi, &Niraj K. Jha, 3rd Edition, Cambridge.
2. Digital Design -Morris Mano, PHI, 3rd Edition, 2006.

REFERENCE BOOKS:
1 Introduction to switching design and logic design _ Fredriac J. Hill, Gerald R. Peterson, 3rd ED, John Wiley & Sons Inc
2. Digital fundamentals – A Systems approach-Thomas L. Floyd, Pearson, 2013.
3. Digital logic design- Ye Brian and Holds Worth, Elsevier.
4. Fundamentals of Logic Design - Charles H. Roth, Thomson Publications, 5th Edition, 2004.
5. Digital Logic Applications and Design - John M. Yarbrough, Thomson Publications, 2006.
6. Digital Logic and state machine design – Comer, 3rd, oxford, 2013.

Course Outcomes

At the end of the course the student will be able to:

1. Identify the various numeric and binary Numbers.
2. Apply the basic theorems to simply the Boolean Functions.
3. Design simple Combinational Circuits.
4. Design simple Sequential Circuits.
5. Distinguish the Finite State Machines

(A30475) DATA COMMUNICATIONS
(Open Elective)

B.Tech. ECE

L	T	P	C
3	0	0	3

Unit I: Introduction to data communications, networking, signals, noise, modulation and demodulation. Data communication network architecture, layered network architecture, open systems interconnection, data communications circuits, serial and parallel data transmission, data communications circuit arrangements, data communication networks, alternate protocol suites. Information capacity, bits, bit rate, baud, and M-ARY encoding.

Unit II: Metallic cable transmission media & optical fiber transmission media: metallic transmission lines, transverse electromagnetic waves, characteristics of electromagnetic waves, transmission line classifications, metallic transmission line types, metallic transmission line equivalent circuit, wave propagation on metallic transmission lines, metallic transmission line losses, block diagram of an optical fiber communications system, optical fiber versus metallic cable facilities.

Unit III: Digital transmission & multiplexing and t-carriers digital transmission: pulse modulation, pulse code modulation, dynamic range, signal–to-quantization noise voltage Ratio, linear versus nonlinear PCM codes
Multiplexing: Time- division multiplexing, t1 digital carrier system, north American digital multiplexing hierarchy, digital line encoding, t carrier systems, European digital carrier system, statistical time – division multiplexing, frame synchronization, frequency- division multiplexing, wavelength- division multiplexing, synchronous optical network

Unit IV: Telephone instruments and signals: The subscriber loop, standard telephone set, basic telephone call procedures, call progress tones and signals, cordless telephones, caller id, electronic telephones, paging systems.
The telephone circuit: The local subscriber loop, telephone message-channel noise and noise weighting, units of powers measurement,

transmission parameters and private-line circuits, voice-frequency circuit arrangements, crosstalk.

Unit V: Data communication codes, bar codes, error control, error detection, error correction, data formats, data communications hardware, character synchronization.

Text Books:
1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education.

Reference Books:
1.Data Communications and Networking, Behrouz A Forouzan, Fourth Edition.Tmh.
2. Computer Communications and Networking Technologies, Gallow, Secondedition Thomson
3. Computer Networking and Internet, Fred Halsll, Lingana Gouda Kulkarni, Fifth Edition, Pearson Education

Course Outcomes:
At the end of the course, the student will be able to:
1. Explain the basic concepts of data communication systems.
2. Distinguish various types of transmission medias for data communications.
3. Compare different multiplexing techniques for digital transmission
4. Aanalyze different telephone instruments, signal and circuits
5. Identify different error detecting and correcting codes.

(A30476) MICROCONTROLLERS & APPLICATIONS
(Open Elective)

B.Tech ECE

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Microprocessors and Microcontrollers: Introduction to Microprocessor and Microcontroller, Number system and Binary arithmetic. Microprocessor Architecture (8085 and 8086) and Microcomputer System, memory map and addressing, memory classification, review of logic device for Interfacing, Memory Interfacing, Overview of 8086 Instruction Set, stacks and Interrupts.

UNIT-II

The 8051 Architecture: 8051 Microcontroller hardware, Program Counter and Data Pointer, A and B CPU registers, Flags and Program Status Word (PSW),Internal Memory : Internal RAM – Stack and Stack Pointer, Special Function Registers, Internal ROM, Input / Output Pins, ports and Circuits, External Memory, Timers and Counters, Serial data Input/ Output, interrupts.

UNIT-III

8051 Instruction set: Assembly Language Programming Process, Addressing Modes, Assembler Directives, Data Transfer, Arithmetic, Logical and Branch Instructions, Decimal Arithmetic, Interrupt Programming, Serial Data Communication.

8051 Programming: Basic Assembly Language Programming, Input/ Output Port Programming, 8051 Timer / Counter Programming, 8051 Serial Communication Programming, 8051 Interrupt Programming.

UNIT-IV

8051 Applications: Introduction, Interfacing Keyboards, Key pads, Interfacing Displays (Seven Segment Displays and LCD's), Interfacing A/D Convertors, Interfacing D/A Convertors, Interfacing Hardware Circuits for Multiple Interrupts, 8051 Interfacing with 8255, Interfacing Eternal Memory with 8051.

UNIT-V

Introduction to Advanced Architectures: ARM and SHARC, Processor and memory organization and Instruction level parallelism; Networked embedded System: Bus protocols, I2 bus and Can bus; Internet-Enabled Systems, Design Example-elevator Controller.

Text Books:

1. K.J. Ayala "The 8051 Micro controller, Architecture, Programming 8- Applications "Thomson Delmar Learning
2. RS Gaonkar, "Microprocessors Architecture, Programming and Applications "Penram International.
3. M. A. Mazidi& J.G Mazidi." The 8051 Micro controller 8- Embedded System "Pearson Education.

Reference Books:

1. B. Ram "Fundamentals of Microprocessors and Microcomputers "DhanpatRai and Sons.
2. 'Computers as Components- Principles of Embedded Computing System Design', Wayne Wolf, Elsevier (2nd Edition)

Course Outcomes:

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

1. Explain the architecture of 8085 and 8086 microprocessors and 8051 microcontrollers.
2. Distinguish various addressing modes, assembler directives and assembly level instructions of 8051 micro controller.
3. Develop assembly language programs for interfacing various I/O devices and memories with 8051 microcontrollers.
4. Apply the knowledge of interfacing various I/O devices and memories with 8051 microcontrollers.
5. Compare architectures of various advanced processors.

(A30477) FUNDAMENTALS OF EMBEDDED SYSTEMS
(Open Elective)

B.Tech ECE

L	T	P	C
3	0	0	3

Unit- I: Introduction to Embedded Systems
Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems

Unit- II: Typical Embedded System
Core of the Embedded System: General Purpose and Domain Specific Processors, Memory, ROM, RAM, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: On-board and External Communication Interfaces.

Unit –III: Embedded Firmware
Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

Unit – IV: RTOS Based Embedded System Design
Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Unit – V: Task Communication
Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization issues, Task Synchronization Techniques, Device Drivers

Text Book:
1. Introduction to Embedded Systems – Shibu K.V. McGraw Hill
2. Embedded Systems – Raj Kamal, TMH

Reference Books:
1. Embedded System Design – Frank Vahid, Tony Givargis, John Wiley.
2. Embedded Systems – Lyla, Pearson, 2013
3. An Embedded Software Primer- David E Simon, Pearson Education

Course outcomes:
At the end of the course the student will be able to:

1. Explain the basics of embedded systems and classify its applications
2. Compare various types of memories, sensors and Input / Output devices.
3. Discuss the embedded firmware for various applications.
4. Interpret the characteristics of Real time operating Systems
5. Illustrate the concepts of shared memory and task communications

(A30478) SENSORS & TRANSDUCERS
(Open Elective)

B.Tech ECE

L	T	P	C
3	0	0	3

Unit – I: Introduction: Definition, principle of sensing & transduction, classification.
Mechanical and Electromechanical sensor: Resistive (potentiometric type): Forms, material, resolution, accuracy, sensitivity. Strain gauge: Theory, type, materials, design consideration, sensitivity, gauge factor, variation with temperature, adhesive, rosettes. Inductive sensor: common types- Reluctance change type, Mutual inductance change type, Magnetostrictive type, material, construction and input output variable, Ferromagnetic plunger type, short analysis.

Unit – II: Capacitive sensors: variable distance-parallel plate type, variable area- parallel plate, serrated plate/teeth type and cylindrical type, variable dielectric constant type, calculation of sensitivity, Proximity sensor. Stretched diaphragm type: microphone, response characteristics. Piezoelectric element: piezoelectric effect, charge and voltage co-efficient, crystal model, materials, natural & synthetic type, their comparison, force & stress sensing, ultrasonic sensors.

Unit – III: Thermal sensors: Resistance change type: RTD materials, tip sensitive & stem sensitive type, Thermistor material, shape, ranges and accuracy specification. Thermoemf sensor: types, thermoelectric power, general consideration, Junction semiconductor type IC and PTAT type. Radiation sensors: types, characteristics and comparison, Pyro electric type.

Unit – IV: Magnetic sensors: Sensor based on Villari effect for assessment of force, torque, proximity, Wiedemann effect for yoke coil sensors, Thomson effect, Hall effect, and Hall drive, performance characteristics. Radiation sensors: LDR, Photovoltaic cells, photodiodes, photo emissive celltypes, materials, construction, response. Geiger counters, Scintillation detectors.

Unit – V: Film Sensors: Thick film and thin film types, Electroanalytic sensors – Electrochemical cell, Polarization types, and membrane electrode types.

Biosensors, Smart/Intelligent sensors, Nano-sensors, Nano-tube sensors, molecular and quantum sensors.

TEXT BOOKS:

1. Sensor & transducers, D. Patranabis, 2nd edition, PHI
2. Instrument transducers, H.K.P. Neubert, Oxford University press.
3. Measurement systems: application & design, E.A.Doebelin, McGraw Hill.

REFERENCE BOOKS:

1. Sensor and Transducers, Third Edition, Ian Sinclair, Newnes.
2. Sensor Technology, Hand Book, JON S. Wilson, Newnes.ELSEVIER.
3. Sensor and Transducers, Characteristics, Applications, Instrumentation, Interfacing, Second Edition, M.J.Usher and D.A.Keating, MACMILLAN Press Ltd.

COURSE OUTCOMES:

At the end of the course the student will be able to:

1. Explain the basic concepts of mechanical and electromechanical sensors, their electrical characteristics.
2. Analyze various capacitor sensors, ultrasonic sensors their electrical characteristics.
3. Compare and elaborate various thermal sensors, principle of operation.
4. Distinguish various magnetic sensors based on their operations, radiation sensors and their operation.
5. Analyze various film sensors and operation of different nano sensors and their applications.

(A30383) FUNDAMENTALS OF ENGINEERING MATERIALS
(OPEN ELECTIVE)

B. Tech. (ECE)

L	T	P	C
3	0	0	3

UNIT – I

Structure of Metals: Crystallography, Miller's indices, Packing Efficiency, Density calculations. Grains and Grain Boundaries. Effect of grain size on the properties. Determination of grain size by different methods. Constitution of Alloys: Necessity of alloying, Types of solid solutions, Hume - Rothery rules, Intermediate alloy phases.

UNIT –II

Phase Diagrams: Construction and interpretation of phase diagrams, Phase rule. Lever rule. Binary phase Diagrams, Isomorphous, Eutectic and Eutectoid transformations with examples.

UNIT – III

Steels: Iron-Carbon Phase Diagram and Heat Treatment: Study of Fe-Fe3C phase diagram. Construction of TTT diagrams. Annealing, Normalizing, Hardening and Tempering of steels, Hardenability. Alloy steels.

UNIT – IV

Cast Irons: Structure and properties of White Cast iron, Malleable Cast iron, Grey cast iron. Engineering Materials-III: Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminium and its alloys, Al-Cu phase diagram, Titanium and its alloys.

UNIT – V

Ceramics, Polymers and Composites: Crystalline ceramics, glasses, cermets: structure, properties and applications. Classification, properties and applications of composites. Classification, Properties and applications of Polymers.

TEXT BOOKS:

1. Material Science and Metallurgy/ Kodgire
2. Essentials of Materials Science and engineering / Donald R. Askeland / Thomson.

REFERENCE BOOKS:

1. Introduction to Physical Metallurgy / Sidney H. Avner.
2. Materials Science and engineering / William and callister.

3. Elements of Material science / V. Rahghavan

Course Outcomes:

At the end of the course the students are able to:

1. Identify the crystalline structure of steel.
2. Understand the theory of time temperature and transformation
3. Determine of different uses of heat treatment in steel.
4. Distinguish between the various forms of steel.
5. Understand the properties of non-ferrous alloys and uses of composite materials.

(A30377) BASICS OF THERMODYNAMICS
(Open Elective)

B. Tech. ECE

L	T	P	C
3	0	0	3

UNIT – I

Introduction: Basic Concepts: System, Control Volume, Surrounding, Boundaries, universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle, Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility

UNIT - II

Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale

UNIT – III

First and Second Laws of Thermodynamics: First Law: Cycle and Process, Specific Heats (cp
and cv), Heat interactions in a Closed System for various processes, Limitations of First Law,
Concept of Heat Engine (H.E.) and Reversed H.E. (Heat Pump and Refrigerator), Efficiency/COP, Second Law: Kelvin-Planck and Clausius Statements, Carnot Cycle, Carnot Efficiency, Statement of Clausius Inequality, Property of Entropy, T-S and P-V Diagrams

UNIT - IV

Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction , Volume fraction and partial pressure, Equivalent Gas const.

Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, , Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation ,Psychrometric chart.

UNIT - V

Power Cycles: Otto, Diesel cycles - Description and representation on P–V and T-S diagram,
Thermal Efficiency, Mean Effective Pressures on Air standard basis
Refrigeration Cycles: Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

TEXT BOOKS:
1. Basic Engineering Thermodynamics / PK Nag / Mc Graw Hill
2. Engineering Thermodynamics / chattopadhyay/ Oxford

REFERENCE BOOKS:
1. Thermodynamics for Engineers / Kenneth A. Kroos , Merle C. Potter/ Cengage
2. Thermodynamics /G.C. Gupta /Pearson

COURSE OUTCOMES:
After completing this course the students will be able to

1. Apply energy balance to systems and control volumes, in situations involving heat and work interactions.
2. Evaluate changes in thermometric properties of substances.
3. Apply the laws of thermodynamics to different systems.
4. Understand the psychrometric properties of air
5. Compare different air standard cycles.

(A30357) FUNDAMENTALS OF MANUFACTURING PROCESSES
(OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

UNIT – I

Casting: Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of moulding sands. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design.

UNIT – II

Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding. Inert Gas Welding - TIG Welding, MIG welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non-destructive testing of welds.

UNIT – III

Hot working, cold working, strain hardening, recovery, recrystallisation, and grain growth. Stamping, forming, and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning. Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – IV

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion

UNIT – V

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects –
cold forging, swaging, Forces in forging operations.

TEXT BOOKS:

1. Manufacturing Technology / P.N. Rao / Mc Graw Hill
2. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson.

REFERENCE BOOKS:

1. Metal Casting / T.V Ramana Rao / New Age
2. Métal Fabrication Technology/ Mukherjee/PHI

Course Outcomes:

For given product, one should be able identify the manufacturing process.

1. Understand the idea for selecting materials for patterns.
2. Learn different types and allowances of patterns used in casting and analyze the components of moulds.
3. Design core, core print and gating system in metal casting processes Understand arc, gas, solid state and resistance welding processes.
4. Develop process-maps for metal forming processes using plasticity principles.
5. Identify the effect of process variables to manufacture defect free products.

(A30379) FUNDAMENTALS OF AUTOMOBILE ENGINEERING
(OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

Unit – I

Introduction: Components of four wheeler automobile – chassis and body – power unit – power transmission rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, re boring, decarburization.

Unit – II

Fuel System: S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pumps – Carburetor – types – air filters – petrol injection.

C.I. Engines: Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, Alternative fuels for Automobiles-injection, Classification, Properties, Hybrid vehicles injection timing, testing of fuel, pumps.

Cooling System: Cooling Requirements, Air Cooling, Liquid Cooling and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporating cooling – pressure sealed cooling – antifreeze solutions.

Unit – III

Electrical System: Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

Ignition System: Function of an ignition system, battery ignition system, constructional features of storage battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

Unit – IV

Transmission System: Clutches, principle, types- cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches,

fluid fly wheel – Gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box , over drive torque converter. Propeller shaft – Hoatch – Kiss drive, Torque tube drive universal joint, differential rear axles – types – wheels and tyres.
Steering System: Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism

Unit – V Suspension System: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.
Braking System: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.

Text books

1. Automobile Engineering ,Vol. 1 & Vol. 2/ Kripal Singh
2.Automobile Engineering , Vol. 1 & Vol. 2 ,by K.M Gupta,Umesh publication

Reference Books

1. A System approach to Automotive Technology by Jack Erjavec YesDee publishing Pvt Ltd.
2. Automobile Engineering / William Crouse
3. Automotive Mechanics / Heitner
4. Alternative fuels of Automobiles by P.Rami Reddy, Frontline publications.

Course outcomes:

By undergoing this course, a student shall be able to

1. Identify power generation, transmission and control mechanisms in an automobile
2. Manipulate the chemical, thermal, mechanical and electrical energies in an automobile
3. Infer the interaction between subsystems
4. Analyze how transmission system works
5. Learn different components of suspension systems.

(A30382) FUNDAMENTALS OF MECHANICAL ENGINEERING
(OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

UNIT - I

Introduction: Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Change of state, Path, Process, Cycle, Internal energy, Enthalpy, Statements of Zeroth Law and First law.

Energy: Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydel, Solar, wind, and bio-fuels, Environmental issues like Global warming and Ozone depletion.

UNIT - II

Properties of gases: Gas laws, Boyle's law, Charle's law, Combined gas law, Gas constant, Relation between Cp and Cv, Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, Poly-tropic process

Properties of Steam: Steam formation, Types of Steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of Steam tables, steam calorimeters.

Steam Boilers: Introduction, Classification, Cochran, Lancashire and Babcock and Wilcox boiler, functioning of different mountings and accessories.

UNIT - III

Heat Engines: Heat Engine cycle and Heat Engine, working substances, Classification of heat engines, Description and thermal efficiency of Carnot; Rankine; Otto cycle and Diesel cycles.

Internal Combustion Engines: Introduction, Classification, Engine details, four- stroke/ two-stroke cycle Petrol/Diesel engines, Indicated power, Brake Power, Efficiencies.

UNIT - IV

Pumps: Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming Air Compressors: Types and operation of Reciprocating and Rotary air compressors, significance of Multistage.

Refrigeration & Air Conditioning: Refrigerant, Vapor compression refrigeration system, vapor absorption refrigeration system, Domestic Refrigerator, Window and split air conditioners.

UNIT - V

Couplings, Clutches and Brakes: Construction and applications of Couplings (Box; Flange; Pin type flexible; Universal and Oldham), Clutches (Disc and Centrifugal), and Brakes (Block; Shoe; Band and Disc).

Transmission of Motion and Power: Shaft and axle, Belt drive, Chain drive, Friction drive, Gear drive.

TEXT BOOKS:

1. Basic Mechanical Engineering / Pravin Kumar/ Pearson 2. Introduction to Engineering Materials / B.K. Agrawal/ Mc Graw Hill

REFERENCE BOOKS:

1. Fundamental of Mechanical Engineering/ G.S. Sawhney/PHI
2. Thermal Science and Engineering / Dr. D.S. Kumar/ Kataria

Course outcomes:

By undergoing this course, a student shall be able to

1. Understand different types of fuels.
2. Explain properties of steam
3. Understand the working Principle of IC Engines.
4. Explain the operations of types of pumps.
5. Know the application of mechanical drives in Transmission of Power.

(A30378) WASTE TO ENERGY
(OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

Unit-I:

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit-II:

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods – Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Unit-III:

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers –Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit-IV:

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit-V:

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion – Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

Text Books:

1. Non Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.

Reference Books:

1. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
2. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons,1996.

Course outcomes:

By undergoing this course, a student shall be able to

1. Understand different Conversion Devices.
2. Explain Biomass Pyrolysis.
3. Understand the working Principle of biomass gasification
4. Explain Biomass Combustion.
5. Know the application of Bio Gas.

(A30358) INDUSTRIAL SAFETY ENGINEERING
(OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

UNIT-I:

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT-II:

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT-III:

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT-IV:

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic ,automotive, thermal and electrical equipment’s like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT-V:

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

TEXT BOOKS

1. Mobley, R. Keith, Lindley R. Higgins, and Darrin J. Wikoff. *Maintenance Engineering Handbook*. New York, NY: Mcgraw-Hill, 2008.
2. Garg, H. P. *Industrial Maintenance*. S Chand, 1976.

REFERENCE BOOKS:

1. Graham, F. D. "Audels Pumps, Hydraulics and Air Compressors. Theo." (1998).
2. Winterkorn, Hans F., and Hsai-Yang Fang. *Foundation engineering handbook*. Springer, Boston, MA, 1991.

Course Outcomes:

At the end of the course, the student should be able to

1. Understand various hazards and their prevention.
2. Apply maintenance techniques to various equipments.
3. Understand types of wear and corrosions and their prevention.
4. Explain fault tracing and its applications.
5. Apply periodic and preventive maintenance techniques to various equipments.

(A30360) WORK SYSTEM DESIGN
(OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

Unit-I

Work System Design: Introduction and Concept of Productivity, Measurement of Productivity, Productivity Measures, Productivity Measurement Models, Factors Influencing Productivity, Causes of Low Productivity, Productivity Measurement Models, Productivity Improvement Techniques, Numerical Problems on productivity, Case study on productivity.

Unit-II

Work Study: Basic Concept, Steps Involved in Work Study, Concept of Work Content,Techniques of Work Study, Human Aspects of Work Study.Method Study: Basic Concept, Steps Involved in Method Study, Recording Techniques, Operation Process Charts, Operation Process Charts: Examples.Flow Process Charts, Flow Process Charts: Examples, Two-Handed-Process Charts, Multiple Activity Charts, Flow Diagrams.

Unit-III

String Diagrams, Principles of Motion Economy, Micro-Motion Study, Therbligs, SIMO Charts, Memo-Motion Study, Cycle graph and Chrono-Cycle Graph, Critical Examination Techniques, Development and Selection of New Method, Installation and Maintenance of Improved Methods.

Unit-IV

Work Measurement: Basic Concept, Techniques of Work Measurement, Steps Involved in Time Study, Steps and Equipment of Time Study, Performance Rating: Examples, Allowances, Computation of Standard Time-I, Computation of Standard Time-II, Case Study .

Unit-V

Work Sampling: Basics, Procedure of Work Sampling Study, Numerical Problems on work sampling, Introduction to Synthetic Data and PMTS, Introduction to MTM and MOST

Ergonomics: Basic Concept, Industrial Ergonomics,Anthropometry, Man-Machine System-1 , Man-Machine System-2

TEXT BOOKS:

1. Introduction to Work Study: International Labor Office (ILO), Geneva.
2. Motion and Time Study Design and Measurement of Work: Ralph M. Barnes, Wiley, The University of California.
3. Industrial Engineering and Production Management: M. Telsang, S. Chand and Company Ltd.

Course Outcomes:

At the end of the course, the student should be able to

1. Calculate the basic work content of a specific job for employees of an organization. Thereby they will be able to calculate the production capacity of man power of an organization.
2. Analyze and calculate the level of risk in a job causing stress, fatigue and musculoskeletal disorders and design appropriate work systems.
3. Rate a worker engaged on a live job and calculate basic, allowed and standard time for the same.
4. Analyze the existing methods of working for a particular job and develop an improved method through questioning technique.
5. Devise appropriate wage and incentive plan for the employees of

(A30258) BASICS OF POWER ELECTRONICS& DRIVES (OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

Course Objective: With the advent of semiconductor devices, revolution is taking place in the power transmission distribution and utilization. This course introduces the basic concepts of power semiconductor devices, converters and choppers and their analysis.

UNIT I: POWER SEMICONDUCTOR DEVICES
Power Semiconductor Devices Construction and Characteristics of Power diodes, Power Transistors, Power MOSFET, Insulated Gate Bipolar transistors (IGBTs) Introduction to Thyristor family: SCR, DIACs, TRIACs

UNIT II: PHASE CONTROLLED (AC TO DC) CONVERTERS
Principle of phase controlled converter operation; Operation of 1-phase half wave converter with R, RL and RLE load; 1- phase full wave converter, Bridge Configuration; Operation with R, RL, RLE load; Operation of 1-phase Semi-converter/ Half controlled converter:

UNIT III: THREE -PHASE CONVERTERS
Operation of half wave converter; Full wave fully controlled converters: Semi-controlled converter; Dual Converter: Principle and operation;, Applications of AC-DC converters

UNIT IV: DC TO DC CONVERTERS
The chopper, Basic principle of DC chopper, Classification of DC choppers, Control strategies Basic DC-DC converter (switch regulator) topologies : Principle, operation Step-down (Buck), Step-up (Boost), Step up/down (Buck-Boost), Continuous conduction and Discontinuous conduction operation, Two zone operation, Four quadrant operation (Operating modes),

UNIT V: POWER CONVERTERS FED DRIVES
Single phase separately excited drives: Half Wave converter, Semiconverter and Fully Controlled converter based drives; Braking operation of separately excited drive Semi-converter and Fully Controlled converter based drives 3-phase separately excited drives:

Half Wave converter, Semi-converter and Fully Controlled converter based drives; Principle of power control (motoring control) of separately excited and series motor with DC-DC Converter;

Text books:

1. M D Singh and K B Khanchandani, “Power electronics”, TMH, New Delhi, 2nd ed., 2007.
2. P.S. Bimbhra, “Power Electronics”, Khanna Publishers, New Delhi, 2012..
3. Muhammad H. Rashid, “Power Electronics - Circuits, Devices and Applications”, Prentice Hall of India, 3rd ed., 2003.

Reference Books:

1. VedamSubramanyam, “Power Electronics – Devices, Converters and Applications”, New Age International Publishers Pvt. Ltd., Bangalore, 2nd ed. 2006.
2. Ned Mohan, Undeland and Robbins, “Power Electronics – Converters, Applications and Design”, John Willey & sons, Inc., 3rd ed., 2003.
3. V.R.Moorthi, “Power Electronics”, Oxford University press, 2005.
4. G..K. Dubey, S.R. Doradla, A. Joshi, and R.M.K. Sinha, “Thyristorised Power Controllers”, New Age International Ltd. Publishers, 1986 (Reprint 2008).
5. P.T. Krein, “Elements of Power Electronics”, Oxford University Press, 1998.
6. G..K. Dubey, “ Fundamentals of Electrical Drives”, Narosa Publishing House, New Delhi, 2nd ed. 2001

Course Outcome:

After learning the course the students should be able to:

1. Explain the construction and characteristics of Power semiconductor devices
2. Analyze the operation of single phase and three phase ac-to-dc converters.
3. Analyze various three phase converters
4. Compare the various types of dc-to-dc converters.
5. Apply the knowledge of power electronic converter for various applications.

(A30252) POWER GENERATION SYSTEMS (OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

UNIT I: THERMAL POWER PLANTS

Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBCBoilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants - Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogenerationsystems.

UNIT II: NUCLEAR POWER PLANTS

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, WorkingofNuclear Reactors: Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada-Deuterium-Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors.Safety measures for Nuclear Power plants.

UNIT III: SOLAR ENERGY

Principles of solar radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, instruments for measuring solar radiation and sun shine, solar radiation data. Photo-voltaicenergyconversion.

Solar energy collection: Flat plate and concentrating collectors,

Storage and applications: solar ponds. Solar Applications- solar heating/cooling technique, solardistillation and drying.

UNIT-IV: WIND&BIO-MASS ENERGY:

Wind: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

Bio-mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

UNIT-V: GEOTHERMAL &OCEAN ENERGY:

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.
Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

TEXT BOOK:

1. Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing CompanyLtd., 2008.
2. Non-Conventional Energy Sources /G.D. Rai
3. Renewable Energy Technologies /Ramesh & Kumar /Narosa

REFERENCES:

1. El-Wakil. M.M., "Power Plant Technology", Tata McGraw – Hill Publishing Company Ltd.,2010.
2. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in associationwith the Open University, 2004.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", SecondEdition, Standard Handbook of McGraw – Hill, 1998
4. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
5. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
6. Solar Energy /Sukhame

Course Outcomes:

After learning the course the students should be able to:

1. Explain the construction and operation of thermal power plants.
2. Analyze the operation of diesel, gas turbine and combined cycle power plants.
3. Illustrate the construction, operation and safety aspects of nuclear power plants.
4. Compare the power derived from renewable energy sources.
5. Identify the economic aspects of power plants.

(A30259) ELECTRICAL & HYBRID VEHICLES (OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

Course Objectives: The objective of the course to know the working of Electric Vehicles and recent trends and to gain knowledge on different power converter topology and control methods used for electric vehicle application

UNIT I: INTRODUCTION TO HEV

Configuration of Electric Vehicles, Performance of Electric Vehicles, Traction motor characteristics, Tractive effort and Transmission requirement, Vehicle performance, Tractive effort in normal driving, Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains

UNIT II: ENERGY STORAGE FOR EV AND HEV

Energy storage requirements, Battery parameters, Types of Batteries, Modelling of Battery, Fuel Cell basic principle and operation, Types of Fuel Cells, PEMFC and its operation, Modelling of PEMFC, Super Capacitors

UNIT III: ELECTRIC PROPULSION

EV consideration, DC motor drives and speed control, Induction motor drives, Permanent Magnet Motor Drives, Switch Reluctance Motor Drive for Electric Vehicles, Configuration and control of Drives.

UNIT IV: DESIGN OF ELECTRIC AND HYBRID ELECTRIC VEHICLES

Series Hybrid Electric Drive Train Design: Operating patterns, control strategies, Sizing of major components, power rating of traction motor, power rating of engine/generator, design of PPS Parallel Hybrid Electric Drive Train Design: Control strategies of parallel hybrid drive train, design of engine power capacity, design of electric motor drive capacity, transmission design, energy storage design

UNIT V: POWER ELECTRONIC CONVERTER FOR BATTERY CHARGING

Charging methods for battery, Termination methods, charging from grid, The Z-converter, Isolated bidirectional DC-DC converter, Design of Z converter for battery charging, High-frequency transformer based isolated charger topology, Transformer less topology

Text books:

1. M. Ehsani, Y. Gao, S. Gay and Ali Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, CRC Press, 2005
2. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003

Reference Books:

1. Sheldon S. Williamson, Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles, Springer, 2013.
2. C.C. Chan and K.T. Chau, Modern Electric Vehicle Technology, OXFORD University Press, 2001.
3. Chris Mi, M. AbulMasrur, David WenzhongGao, Hybrid Electric Vehicles Principles and Applications With Practical Perspectives, Wiley Publication, 2011.

List of Open Source Software/learning website:

- E-materials available at the website of NPTEL- http://nptel.ac.in/

MATLAB (Trial version): Software is useful for simulation and analysis of electrical systems

Course Outcome:

After learning the course the students should be able to:

1. Demonstrate the working of Electric Vehicles and recent trends.
2. Analyze the energy storage requirements of EV and HEV.
3. Develop the electric propulsion unit and its control for application of electric vehicles.
4. Make use of various parameters for the design of EV and HEV.
5. Analyze different power converter topology used for electric vehicle application.

(A30260) ELECTRICAL SAFETY
(OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

UNIT I: CONCEPTS AND STATUTORY REQUIREMENTS

Introduction – electrostatics, electro magnetism, stored energy, energy radiation and electromagnetic interference – Working principles of electrical equipment-Indian electricity act and rules-statutory requirements from electrical inspectorate-international standards on electrical safety – first aid-cardio pulmonary resuscitation (CPR).

UNIT II: ELECTRICAL HAZARDS

Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity. Energy leakage-clearances and insulation-classes of insulation-voltage classifications-excess energy current surges-Safety in handling of war equipments-over current and short circuit current-heating effects of current-electromagnetic forces-corona effect-static electricity –definition, sources, hazardous conditions, control, electrical causes of fire and explosion-ionization, spark and arc ignition energy-national electrical safety code ANSI. Lightning, hazards, lightning arrestor, installation – earthing, specifications, earth resistance, earth pit maintenance.

UNIT III: PROTECTION SYSTEMS

Fuse, circuit breakers and overload relays – protection against over voltage and under voltage – safe limits of amperage – voltage –safe distance from lines-capacity and protection of conductor-joints-and connections, overload and short circuit protection-no load protection-earth fault protection. FRLS insulation-insulation and continuity test-system grounding-equipment grounding-earth leakage circuit breaker (ELCB)-cable wires-maintenance of ground-ground fault circuit interrupter-use of low voltage-electrical guards-Personal protective equipment – safety in handling hand held electrical appliances tools and medical equipments.

UNIT IV: SELECTION, INSTALLATION, OPERATION AND MAINTENANCE

Role of environment in selection-safety aspects in application - protection and interlock-self diagnostic features and fail-safe concepts-lock out and work permit system-discharge rod and earthing devices safety in the use of portable tools-cabling and cable joints-preventive maintenance.

UNIT V: HAZARDOUS ZONES

Classification of hazardous zones-intrinsically safe and explosion proof electrical apparatus-increase safe equipment-their selection for different zones-temperature classification-grouping of gases-use of barriers and isolators-equipment certifying agencies.

REFERENCES

1.” Accident prevention manual for industrial operations”, N.S.C., Chicago, 1982.

2. Indian Electricity Act and Rules, Government of India.

3. Power Engineers – Handbook of TNEB, Chennai, 1989.

4. Martin Glov Electrostatic Hazards in powder handling, Research Studies Pvt. Ltd., England
1988.

5. Fordham Cooper, W., “Electrical Safety Engineering” Butterworth and Company, London, 1986.

Course Outcome:

After learning the course the students should be able to:

1. Illustrate the concept and necessity of electrical safety
2. Explain the possibilities of electrical hazards and its preventive measures
3. Identify the appropriate protective system to be adopted against various electrical hazards
4. Demonstrate the selection, installation, operation of various protective equipments.
5. Compare various hazardous zone and to identify the appropriate protective equipment for those zones.

(A30253) FUEL CELL TECHNOLOGY
(OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

Course Objective: The main objectives of the Fuel Cell Technology is to gain knowledge on the working of various types of fuel cells, use of the fuel cell for automotive applications compare the performance characteristics and explain the knowledge of hydrogen storage systems

UNIT I: INTRODUCTION TO FUEL CELLS

Introduction – working and types of fuel cell – low, medium and high temperature fuel cell, liquid and methanol types, proton exchange membrane fuel cell solid oxide, hydrogen fuel cells – thermodynamics and electrochemical kinetics of fuel cells

UNIT II: FUEL CELLS FOR AUTOMOTIVE APPLICATIONS

Fuel cells for automotive applications – technology advances in fuel cell vehicle systems – onboard hydrogen storage – liquid hydrogen and compressed hydrogen – metal hydrides, fuel cell control system – alkaline fuel cell – road map to market.

UNIT III: FUEL CELL COMPONENTS AND THEIR IMPACT ON PERFORMANCE

Fuel cell performance characteristics – current/voltage, voltage efficiency and power density, ohmic resistance, kinetic performance, mass transfer effects – membrane electrode assembly components, fuel cell stack, bi-polar plate, humidifiers and cooling plates.

UNIT IV: HYDROGEN STORAGE TECHNOLOGY

Hydrogen storage technology – pressure cylinders, liquid hydrogen, metal hydrides, carbon fibers – reformer technology – steam reforming, partial oxidation, auto thermal reforming – CO removal, fuel cell technology based on removal like bio-mass.

UNIT V: FUEL CYCLE ANALYSIS

Fuel Cycle Analysis – application to fuel cell and other competing technologies like battery powered vehicles, SI engine fueled by natural gas and hydrogen and hybrid electric vehicle.

Reference:

1. Fuel Cells for automotive applications – professional engineering publishing UK. ISBN 1- 86058 4233, 2004.
2. Fuel Cell Technology Handbook SAE International GregorHoogers CRC Press ISBN 0-8493-0877-1-2003.

Course Outcomes:

After learning the course the students should be able to:

1. Demonstrate the working of various types of fuel cells.
2. Make use of the fuel cell for automotive applications.
3. Compare the fuel cell performance characteristics.
4. Explain the concept of hydrogen storage systems.
5. Analyze the fuel cycle.

(A30255) ENERGY EFFICIENCY IN ELECTRICAL UTILITIES (OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

Course Objectives: The objective of this course is to gain knowledge on energy efficient technologies for electrical systems and choose the appropriate energy efficient method for lighting, fanning, and pumping, cooling, compressed air and refrigeration systems.

UNIT I: ELECTRICALSYSTEMS & ELECTRIC MOTORS

Introduction of Electrical systems, Tariff and economic considerations; T & D losses, Electrical load management; Maximum demand management, Role of Power factor and its improvement- Electric Power systems analysis -Energy Efficient Technologies in Electrical Systems - Motor Types, Characteristics, Efficiency - Energy Efficient Motors - Factors affecting Energy efficiency of a motor - Soft starters, Variable speed drives

UNIT II: COMPRESSED AIR SYSTEMS &HVAC

Introduction, Compressor types and performance; Compressed air syste ms components;

Efficient operation of compressed air systems, Systems capacity assess ment -Energy conservation opportunities

UNIT III: REFRIGERATION SYSTEMS.

Introduction: Types of Refrigeration systems; Common Refrigerant an d Properties -compressor types and applications -

Performance assessment of Refrigeration plants -

Energy conservation opportunities

UNIT IV: FANS, PUMPING SYSTEMS AND COOLING TOWERS

Types, Performance evaluation, efficient system operation, Capacity selections - Performance assessment of fans and blowers - Energy conservation opportunities

Types, Performance evaluation, efficient system operation - Energy conservation opportunities in pumping systems - Introduction to cooling towers; cooling tower performance, efficient system operation-Energy conservation opportunities in cooling towers.

UNIT V: LIGHTING SYSTEMS

Basic terms of lighting systems; Lamp and Luminaries types, recommended illumination level-Methodology of lighting systems energy efficiency study - Cast study, Energy conservation opportunities

Text Books

1. Capehart, Turner, Kennedy. Guide to Energy Management. Fifth Ed. The Fairmount Press, 2006.
2. Thumann, Younger. Handbook of Energy Audit. Sixth Ed. The Fairmount Press, 2003.
3. Thumann, Mehta. Handbook of Energy Engineering. Fifth Ed. Th e Fairmount Press, 2001

References Books (DRE 201, 202 and 203)

1. General Aspect of Energy Management and Energy Audit, 2010, BEE Guide book
2. Energy Efficiency in Thermal Utilities, 2010, BEE guide book
3. Energy Efficiency in Electrical Utilities, 2010, BEE guide book
4. Turner WC. Energy Management Handbook, 5th Edition, The Fairmont Press, 2005

Course Outcome:

After learning the course the students should be able to:

1. Explain the energy efficient technologies meant for electrical systems.
2. Examine the energy conservation opportunities in compressed air and HVAC systems.
3. Assess the performance of refrigeration plants.
4. Choose the appropriate energy efficient method for fanning, pumping, cooling, compressed air and refrigeration systems.
5. Analyze various efficient lighting systems and their energy conservation measures.

(A30256) ENERGY AUDIT & CONSERVATION
(OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

UNITI: Basic Principles of Energy Audit

Energy audit- definitions, concept, types 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.

UNITII: Energy Management

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting- Energy manger, Qualities and functions, language, Questionnaire – check list for top management.

UNITIII: Energy Efficient Motors

Energy efficient motors, factors affecting efficiency, loss distribution, constructional details, characteristics – variable speed, variable duty cycle systems, RMS hp- voltage variation-voltage unbalance- over motoring- motor energy audit

UNIT IV: Power Factor Improvement, Lighting and Energy Instruments

Power factor – methods of improvement, location of capacitors, pf with non-linear loads, effect of harmonics on power factor, power factor motor controllers – Good lighting system design and practice, lighting control, lighting energy audit – Energy Instruments- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers, application of PLC's.

UNITV: Economic Aspects and Analysis

Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis- Energy efficient motors- calculation of simple payback method, net present worth method- Power factor correction, lighting – Applications of life cycle costing analysis, return on investment.

TEXT BOOKS:

1. Energy management by W.R. Murphy AND G. Mckay Butter worth, Heinemann publications.
2. Energy management by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998

REFERENCES:

1. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd-2nd edition, 1995-
2. Energy management hand book by W.C.Turner, John wiley and sons
3. Energy management and good lighting practice : fuel efficiency- booklet 12-EEO

Course Outcomes

On completion of the course, students will be able to

1. Explain the various methods of energy audit.
2. Illustrate the energy management strategies.
3. Perform energy audit in energy efficient motors.
4. Relate the energy conservation with the improvement in energy efficiency and power factor.
5. Analyze the economic aspects to be considered in energy usage.

(A30257) NANO TECHNOLOGY
(OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

Course Objective: This coursedeals with the characteristics and properties of nano-materials the tools to characterize the nano-materials. utilization of nano-materials for various applications.

UNIT I: NTRODUCTION
History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects.

UNIT II: UNIQUE PROPERTIES OF NANOMATERIALS
Microstructure and Defects in Nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple and declinations, Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility. Magnetic Properties: Soft magnetic nanocrystalline alloy, Permanent magnetic nano-crystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

UNITIII: SYNTHESIS ROUTES
Bottomup approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgelmethod, Self-assembly, top-down approaches: Mechanical alloying, Nano-lithography, Consolidation of Nanopowders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing, Spark plasma sintering.

UNITIV: TOOLS TO CHARACTERIZENANOMATERIALS
X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nanoindentation.

UNITV: APPLICATIONS OF NANOMATERIALS

Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, WaterTreatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Défense and Space Applications, Concerns and challenges of Nanotechnology.

TEXT BOOKS:

1. Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.
2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

REFERENCES BOOKS:

1. Nano: The Essentials by T. Pradeep, Mc Graw- Hill Education.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek.
3. Transport in Nano structures- David Ferry, Cambridge University press 2000
4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S., S. R. Kumar, J. H. Carola.
5. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University press

Course Outcomes

On completion of the course, students will be able to

1. Classify nanostructured materials.
2. Illustrate the characteristics and properties of nano-materials.
3. Identify the synthesis routes of nano-materials.
4. Make use of the tools to characterize the nano-materials.
5. Utilize the nano-materials for various applications.

(A30160) DISASTER MANAGEMENT AND MITIGATION (OPEN ELECTIVE)

B. Tech. ECE

L	T	P	C
3	0	0	3

UNIT - I:

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical reserches.

UNIT - II:

Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man indeced hazards & Disasters - Natural Hazards - Planetary Hazards / Disasters - Extra Planetary Hazards / disasters - Planetary Hazards - Endongenous Hazards - Exogenous Hazards

UNIT - III:

Endogenous Hazards - Volcanic eruption - Earthquakes - landslides - Volcanic Hazards / Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards / disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - Human adjusment, perception & mitigation of earthquake.

UNIT - IV:

Exogenous hazards / disasters - Infrequent events - Cumulative atmospheric hazards / disasters

Infrequent events: Cyclones - Lightning - Hailstorms

Cyclones: Tropical cyclones & Local stroms - Destruction by tropical cyclones & local stroms (causes, distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/ disasters :- Floods - Droughts - Cold waves - Heal waves Floods :- Causes of floods - Flood hazards India - Flood control measures (Human adjustment, perception & mitigation) Droughts :- Impacts of droughts - Drought hazards in India - Drought control measures - Extra Planetary Hazards / Disasters - man induced Hazards / Disasters - Physical hazards / Disasters - Soil erosion

Soil Erosion: Mechanics & forms of Soil Erosion - Factors 7 causes of Soil Erosion - Conservation measures of Soil Erosion.

Chemical hazards / disasters: Release of toxic chemicals, nuclear explosion - Sedimentation processes Sedimentation processes: - Global Sedimentation problems - Regional Sedimentation problems - Sedimentation & Environmental problems - Corrective measures of Erosion & Sedimentation

Biological hazards / disasters: Population Explosion.

UNIT - V:

Emerging approaches in Disaster Management - Three stages

1. Pre-disaster Stage (preparedness)
2. Emergency Stage
3. Post Disaster stage - Rehabilitation

TEXT BOOKS:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014.
3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015

REFERENCES:
1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

Course outcomes

On completion of the course, students will be able to

1. Explain the Environmental Hazards & Disasters.
2. Discuss about Types of Environmental hazards & Disasters.
3. Explain the Endogenous Hazards Exogenous hazards.
4. Apply Emerging approaches in Disaster Management.
5. Recognizes the stakeholders in disaster management system, their jurisdiction and responsibilities.

(A30161) REMOTE SENSING AND GIS
(OPEN ELECTIVE)

B. Tech. ECE

L	T	P	C
3	0	0	3

Course Objectives:

- This course will make the student to understand about the principles of GIS, Remote Sensing, Spatial Systems, and its applications to Engineering Problems.

UNIT – I

Introduction to Photogrammetric: Principles& types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line.

UNIT – II

Remote Sensing: Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process. Electro-magnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.

UNIT – III

Geographic Information Systems: Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- Attribute data Management –Data display- Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters commonly used Map Projections - Projected coordinate Systems

UNIT – IV

Vector Data Model: Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geo-base data model; Geometric representation of Spatial Feature and data structure, Topology rules

UNIT – V

Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data
Structure, Data Conversion, Integration of Raster and Vector data.

Data Input: Metadata, Conversion of Existing data, creating new data; Remote Sensing data,
Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map,
Data Editing.

TEXT BOOKS:

1. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
2. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
3. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-
Hill-2015

REFERENCES:

1. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall
(India)Publications.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael
A.Mc Donnell, Oxford Publishers 2004.
3. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.

Course Outcomes:

At the end of the course, the student will be able to:

1. Retrieve the information content of remotely sensed data
2. Analyze the energy interactions in the atmosphere and earth surface features
3. Interpret the images for preparation of thematic maps
4. Apply problem specific remote sensing data for engineering applications
5. Analyze spatial and attribute data for solving spatial problems

(A30162) GREEN BUILDINGS
(OPEN ELECTIVE)

B. Tech. ECE

L	T	P	C
3	0	0	3

Course Objectives:

- To sensitize about the various aspects of sustainable and green building design in the context of global warming and climate change.
- To study the building materials for its impact on environment.

UNIT I - INTRODUCTION

A historical perspective. General premises and strategies for sustainable and green design, objectives and basis. Bio-mimicry as a design tool based on ecosystem analogy.

UNIT II - GREEN CONSTRUCTION AND ENVIRONMENTAL QUALITY

Sustainable architecture and Green Building: Definition, Green building evaluation systems; LEED Certification; Green Globe Certification; Case studies which look at the environmental approach; Renewable Energy; Controlling the water cycle, Impact of materials on environment; Optimizing construction; Site management; Environmental management of buildings.

UNIT III - PASSIVE DESIGN IN MATERIALS

Passive Design and Material Choice – Traditional Building Materials – Importance of envelopematerial in internal temperature control – Specification for walls and roofs in different climate –Material and Humidity Control.

UNIT IV - ECO HOUSE

The form of the house, the building as an analogy. Building concepts: energy loss, insulation, passive solar gain, active solar gain, health benefits, and sustainable materials. Small scale wind and hydro power systems. Case study of eco house.

UNIT V - SUSTAINABLE AND GREEN BUILDING DESIGN STUDIO

This studio will explore collaborative learning to explore, investigate and apply various parameters of sustainability for design development of projected building/ urban scenarios.

REFERENCES

1. Ken Yeang: Eco Design- A manual for Ecological design; Wiley Academy, 2006.
2. Sue Roaf et all: Ecohouse, A design guide; Elsevier Architectural Press, 2007.
3. Thomas E Glavinich: Green Building Construction; Wiley, 2008.
4. Brenda and Robert Vale: Green Architecture, Design for a Sustainable Future; Thames and Hudson, 1996.

Course Outcomes:

At the end of the course, the student will be able to:

1. Understand the concepts of green buildings
2. Explain the sustainability.
3. Define renewable energy conservation through material usage.
4. Explain the Eco House system
5. Designing green buildings.

(A30163) AIR POLLUTION AND CONTROL
(OPEN ELECTIVE)

B. Tech. ECE

L	T	P	C
3	0	0	3

Course Objectives: This course will enable students to

- Study the sources and effects of air pollution
- Learn the meteorological factors influencing air pollution.
- Analyze air pollutant dispersion models
- Illustrate particular and gaseous pollution control methods.

UNIT – I

Introduction: Definition, Sources, classification and characterization of air pollutants. Effects of air pollution on health, vegetation & materials. Types of inversion, photochemical smog.

UNIT – II

Meteorology: Temperature lapse rate & stability, wind velocity & turbulence, plume behavior, measurement of meteorological variables, wind rose diagrams, Plume Rise, estimation of effective stack height and mixing depths.

UNIT – III

Sampling: Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants (PM2.5, PM10, SOX, NOX, CO, NH3). Development of air quality models-Gaussian dispersion model-Including Numerical problems.

UNIT – IV

Control Techniques: Particulate matter and gaseous pollutants-settling chambers, cyclone separators, scrubbers, filters & ESP - Including Numerical problems. Site selection for industrial plant location.

UNIT – V

Air pollution due to automobiles, standards and control methods. Noise pollution- causes, effects and control, noise standards. Environmental issues, global episodes. Environmental laws and acts.

Textbooks:

1. M. N. Rao and H V N Rao, "Air pollution", Tata Mc-G raw Hill Publication.
2. H. C. Perkins, "Air pollution". Tata McGraw Hill Publication.
3. Mackenzie Davis and David Cornwell, "Introduction t o Environmental Engineering" McGraw-Hill Co.

Reference Books:

1. Noel De Nevers, "Air Pollution Control Engineering", Waveland Pr Inc.
2. Anjaneyulu Y, "Text book of Air Pollution and Control Technologies", Allied Publishers

Course outcomes:

After studying this course, students will be able to:

1. Identify the major sources of air pollution and understand their effects on health and environment.
2. Evaluate the dispersion of air pollutants in the atmosphere and to develop air quality models.
3. Ascertain and evaluate sampling techniques for atmospheric and stack pollutants.
4. Choose and design control techniques for particulate and gaseous emissions.
5. Demonstrates the knowledge about Air pollution control which is essential for environmental protection and it gives a particular solution to the life threating problem.

(A30164) BASICS OF CIVIL ENGINEERING (OPEN ELECTIVE)

B. Tech. ECE

L	T	P	C
3	0	0	3

Course Objectives

- To inculcate the essentials of Civil Engineering field to the students of all branches of Engineering.
- To provide the students an illustration of the significance of the Civil Engineering Profession in satisfying societal needs.

UNIT – I

General introduction to Civil Engineering - Introduction to types of buildings, Components of a residential building, Introduction to industrial buildings; Introduction to planning of residential buildings - Simple building plans;

UNIT – II

Introduction to the various building area terms; Setting out of a building; Surveying – Principles, Objectives, Horizontal measurements with tapes, Ranging;

UNIT – III

Levelling – Instruments, Reduction of levels; Modern surveying instruments; Building materials – Bricks, cement blocks, Cement, Cement mortar, Steel;

UNIT – IV

Building construction – Foundations, Brick masonry, Roofs, Floors, Decorative finishes, Plastering, Paints and Painting;

UNIT – V

Basic infrastructure and services – Elevators, Escalators, Ramps, Air conditioning, Sound proofing, Towers, Chimneys, Water Tanks; Intelligentbuildings.

References Books:

1. Chudley, R., Construction Technology, Vol. I to IV, Longman Group, England

2. Chudley, R. and Greeno, R., Building Construction Handbook, Addison Wesley, Longman Group, England
3. Gopi, S., Basic Civil Engineering, Pearson Publishers
4. Kandya, A. A., Elements of Civil Engineering, Charotar Publishing house
5. Mamlouk, M. S., and Zaniewski, J. P., Materials for Civil and Construction Engineering, Pearson Publishers.

Course outcomes:

After studying this course, students will be able to:

1. Illustrate the fundamental aspects of Civil Engineering.
2. Plan and set out a building.
3. Explain the concepts of surveying for making horizontal and vertical measurements.
4. Illustrate the uses of various building materials and explain the method of construction of different components of a building.
5. Discuss about various services in a building.

(A30165) SUSTAINABILITY CONCEPTS IN CIVIL ENGINEERING
(OPEN ELECTIVE)

B. Tech. ECE

L	T	P	C
3	0	0	3

Course Objectives: This course will enable students to

- Learn about the principles, indicators and general concept of sustainability.
- Apprehend the local, regional and global impacts of unsustainable designs, products and processes.
- Student shall be able to apply the sustainability concepts in engineering
- Know built environment frame work sand their use
- Understand how building and design is judged and valued by clients and stakeholders and how to implement sustainability.

UNIT – I

Introduction: Sustainability - Introduction, Need and concept of sustainability, Social-environmental and economic sustainability concepts . Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Environmental legislations in India - Water Act, Air Act.

UNIT – II

Global Environmental Issue: Resource degradation, Climate change, Regional and Local Environmental Issues. Carbon credits and carbon trading, carbon foot print Carbon sequestration – Carbon capture and storage (CCS). Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) - Scope and Goal, Bio-mimicking.

UNIT – III

Sustainable Design: Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification- GRIHA & IGBC Certification for buildings, Energy efficient building design- Passive solar design technique, Thermal storage, Cooling strategies, high performance insulation. Sustainable cities, Sustainable transport.

UNIT – IV

Clean Technology and Energy: Energy sources: Basic concepts-Conventional and non-conventional, solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans, Geothermal energy. Rainwater harvesting.

UNIT – V

Green Engineering: Green Engineering concepts, Sustainable Urbanization, industrialization and poverty reduction; Social and technological change, Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis.

Textbooks:

1. Allen, D.T. and S honnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
2. Bradley. A.S; Adebayo, A. O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.

Reference Books:

1. Mackenthun, K. M.,Basic Concepts in Environmental Management, Lewis Publication.
2. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency PublicationsRating System, TERI Publications - GRIHA Rating System.
3. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
4. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
5. Malcolm Dowden, Climate Change and Sustainable Development: Law, Policy and Practice.
6. Daniel A. Vallero and Chris Brasier, “Sustainable Design: The Science of Sustainability and Green Engineering”, Wiley-Blackwell.
7. Sustainable Engineering Practice: An Introduction, Committee on Sustainability, American Society of Civil Engineers.

Course Outcomes:

After studying this course, students will be able to:

1. Understanding of their social responsibility as future professionals and citizens.

2. Learn the sustainability concepts; understand the role and responsibility of engineers in sustainable development.

3. Quantify sustainability, and resource availability, Rationalize the sustainability based on scientific merits.

4. Understand and apply sustainability concepts in construction practices, designs, product developments and processes across various engineering disciplines.

5. Make a decision in applying green engineering concepts and become a lifelong advocate of sustainability in society.

(A30166) ENVIRONMENTAL PROTECTION AND MANAGEMENT
(OPEN ELECTIVE)

B. Tech. ECE

L	T	P	C
3	0	0	3

Course Objectives:

- This course will enable students to gain knowledge in Environmental protection and Management systems

UNIT – I

Environmental Management Standards: Unique Characteristics of Environmental Problems – Systems approach to Corporate environmental management - Classification of Environmental Impact Reduction Efforts - Business Charter for Sustainable Production and Consumption – Tools, Business strategy drivers and Barriers - Evolution of Environmental Stewardship. Environmental Management Principles - National policies on environment, abatement of pollution and conservation of resources - Charter on Corporate responsibility for Environmental protection.

UNIT – II

Environmental Management Objectives: Environmental quality objectives – Rationale of Environmental standards: Concentration and Mass standards, Effluent and stream standards, Emission and ambient standards, Minimum national standards, environmental performance evaluation: Indicators, benchmarking. Pollution control Vs Pollution Prevention - Opportunities and Barriers – Cleaner production and Clean technology, closing the loops, zero discharge technologies.

UNIT – III

Environmental Management System: EMAS, ISO 14000 - EMS as per ISO 14001– benefits and barriers of EMS – Concept of continual improvement and pollution prevention - environmental policy – initial environmental review – environmental aspect and impact analysis – legal and other requirements- objectives and targets – environmental management programs – structure and responsibility – training awareness and competence- communication – documentation and document control – operational control – monitoring and measurement – management review.

UNIT – IV

Environmental Audit: Environmental management system audits as per ISO 19011- – Roles and qualifications of auditors - Environmental performance indicators and their evaluation – Non conformance – Corrective and preventive actions -compliance audits – waste audits and waste minimization planning – Environmental statement (form V) - Due diligence audit.

UNIT – V

Applications: Applications of EMS, Waste Audits and Pollution Prevention Control: Textile, Sugar, Pulp & Paper, Electroplating, , Tanning industry. Hazardous Wastes - Classification, characteristics Treatment and Disposal Methods, Transboundary movement, disposal.

Reference Books:

1. Christopher Sheldon and Mark Yoxon, “Installing Environmental management Systems – a step by step guide” Earthscan Publications Ltd, London, 1999.
2. ISO 14001/14004: Environmental management systems – Requirements and Guidelines – International Organisation for Standardisation, 2004
3. ISO 19011: 2002, “Guidelines for quality and/or Environmental Management System auditing, Bureau of Indian Standards, New Delhi, 2002
4. Paul L Bishop „Pollution Prevention: Fundamentals and Practice, McGraw- Hill International, Boston, 2000.
5. Environmental Management Systems: An Implementation Guide for Small and Medium-Sized Organizations, Second Edition, NSF International, Ann Arbor, Michigan, January 2001

Course outcomes: After studying this course, students will be able to:

1. Appreciate the elements of Corporate Environmental Management systems complying to international environmentalmanagement system standards.
2. Lead pollution prevention assessment team and implement waste minimization options.
3. Discover effective methods of waste management, Understand environmental laws and sustainable development

4. Categorize different types of pollutions and their control measures, Analyze global environmental problems and come out with best possible solutions.
5. Develop, Implement, maintain and Audit Environmental Management systems for Organizations.

(A30167) ALTERNATE BUILDING MATERIALS (OPEN ELECTIVE)

B. Tech. ECE

L	T	P	C
3	0	0	3

Course Objectives: This Course will enable students to:

- understand environmental issues due to building materials and the energy consumption inmanufacturing building materials
- study the various masonry blocks, masonry mortar and structural behavior of masonry undercompression.
- Study the alternative building materials in the present context.
- understand the alternative building technologies which are followed in present construction field.

UNIT – I

Introduction: Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle energy, Global warming and construction industry, Green concepts in buildings, Green building ratings – IGBC and LEED manuals – mandatory requirements, Rainwater harvesting & solar passive architecture. Environmental friendly and cost effective building technologies, Requirements for buildings of different climatic regions.

UNIT – II

Elements of Structural Masonry: Elements of Structural Masonry, Masonry materials, requirements of masonry units' characteristics of bricks, stones, clay blocks, concrete blocks, stone boulders, laterite Blocks, Fal- G blocks and Stabilized mud block. Manufacture of stabilized blocks.

Structural Masonry Mortars: Mortars, cementations materials, sand, natural & manufactured, types of mortars, classification of mortars as per BIS, characteristics and requirements of mortar, selection of mortar. Uses of masonry, masonry bonding, Compressive strength of masonry elements, Factors affecting compressive strength, Strength of Prisms/wallets and walls, Effect of brick bond on strength, Bond strength of masonry: Flexure and shear, Elastic properties of masonry materials and masonry, Design of masonry compression elements subjected to axial load.

UNIT – III

Alternate Building Materials: Lime, Pozzolana cements, Raw materials, Manufacturing process, Properties and uses. Fibers- metal and synthetic, Properties and applications. Fiber reinforced plastics, Matrix materials, Fibers organic and synthetic, Properties and applications. Building materials from agro and industrial wastes ,Types of agro wastes, Types of industrial and mine wastes, Properties and applications. Masonry blocks using industrial wastes. Construction and demolition wastes.

UNIT – IV

Alternate Building Technologies: Use of arches in foundation, alternatives for wall constructions, composite masonry, confined masonry, cavity walls, rammed earth, Ferro cement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications. Top down construction, Mivan Construction Technique. Alternate Roofing Systems: Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes.

UNIT – V

Equipment for Production of Alternate Materials: Machines for manufacture of concrete, Equipments for production of stabilized blocks, Moulds and methods of production of precast elements, Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using alternatives.

Textbooks:

1. KS Jagadish, B V Venkatarama Reddy and K S Nanjunda Rao, “Alternative Building Materials andTechnologies”, New Age International pub.
2. Arnold W Hendry, “Structural Masonry”, Macmillan Publishers.

Reference Books:

1. RJS Spence and DJ Cook, “Building Materials in Developing Countries”, Wiley pub.
2. LEED India, Green Building Rating System, IGBC pub.
3. IGBC Green Homes Rating System, CII pub.
4. Relevant IS Codes.

Course Outcomes:
After studying this course, students will be able to:

1. Principle of building planning and by laws and standards of building material Components and orientation of the building.

2. Solve the problems of Environmental issues concerned to building materials and cost-effective building technologies

3. Select appropriate type of masonry unit and mortar for civil engineering constructions; also, they are able to Design Structural Masonry Elements under Axial Compression.

4. Analyse different alternative building materials which will be suitable for specific climate and in an environmentally sustainable manner. Also capable of suggesting suitable agro and industrial wastes as a building material.

5. Recommend various types of alternative building materials and technologies and design a energy efficient building by considering local climatic condition and building material by considering local climatic condition and building material.

(C30161) LOGISTICS AND SUPPLY CHAIN MANAGEMENT (OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

The Objective of this course is to gain the knowledge of possibilities of efficient optimization and management of operation in integrated supply chains and also the ability to apply them in the enterprise reality. The course will also strengthen the holistic view on supply chain operations, management and strategy and some current research areas in supply chain management. Consequently the course provides advanced knowledge about logistics and their supporting systems from a supply chain perspective.

***The students need Statistical Table to solve numerical problems.**
Prerequisite for the course:- Knowledge of Production and Operations Management, Marketing Management and QABLogistics and Supply Chain Management D taught in second semester of the Programme.

Unit – I

Understanding the Supply Chain: Objective and Importance of Supply Chain Process View of Supply Chain. Competitive and Supply Chain Strategies, Achieving Strategic Fit, Expanding Strategic Scope. Logistics: The Logistical value preposition, The Work of Logistics, Logistical operations, Logistical operating arrangements, Supply chain Synchronization, Supply Chain Drivers and Metrics: Drivers for Supply Chain Performance, Framework for Structuring drivers. Facilities, inventory, transportation, information, sourcing and pricing. Obstacles to Achieving fit, Supply chain performance in India. Case studies

Unit – II

Designing the Supply Chain Network : Role of distribution in the Supply Chain, Factors influencing Distribution network design, Design options for Distribution network, The role of network design in the Supply Chain, Frame work for Network design decisions, Models for facility location and capacity allocation, Planning Demand and Supply in a Supply Chain: Demand Forecasting in Supply Chain: Components of forecast and forecasting methods, Aggregate Planning in Supply

Chain: Role of aggregate planning, Aggregate planning Strategies , Inventory planning and economic theory aberrations. Case studies

Unit – III

Planning and Managing inventories in Supply Chain: Managing Economies of Scale in Supply Chain, Managing Uncertainty in a Supply Chain, Determining optimal level of product inventory. Designing and Planning Transportation Networks: Transportation in a Supply Chain. Case studies

Unit – IV

Managing Cross Functional Drivers in a Supply Chain: Sourcing decisions in a Supply Chain and procurement strategies, Pricing and Revenue Management in a Supply Chain, Information Technology and Coordination in a Supply chain. Case studies

Unit- V

Logistics and Supply chain relationships: Identifying logistics performance indicators –Channel structure – Economics of distribution –channel relationships –logistics service alliances. Managing Global logistics and Global supply chains: Logistics in a global economy – views of global logistics- global operating levels – interlinked global economy - The Global supply chains , Supply Chain Management in Global environment–Global strategy – Global purchasing – Global logistics–Global alliances –Issues and Challenges in Global supply chain Management – Case studies

References

1. Sunil Chopra and Peter Meindl: Supply chain Management: Strategy, Planning and Operation, Third edition, Pearson, 2009.
2. Donald J.Bowersox and David J.Closs: Logistical Management: The Integrated Supply Chain Process, TMH, 2006.
3. Rajasekhar&Acharyulu: Logistics and Supply Chain Management, Excel, 2009.
4. Sridhara Bhat: Logistics and supply chain management, Himalaya, 2009.
5. John T Mentzer: Supply Chain Management, Sage Publications, 2008
6. Donal Waters: Global Logistics, Kogan Page, 2009
7. Christainschuh et al:The purchasing chess board, Springer link,2009.

8. Philip B.Schary, TageSkjott-Larsen: Managing the Global Supply Chain, Viva, 2008.
9. Joel D wisner, Keong Leong, KeahChoon Tan: Principles of Supply Chain Management- A Balanced approach, Cengage Learning, 2008
10. Rahul V Altekar: Supply Chain Management, Concepts and Cases, PHI , 2008
11. J.L.Gattorna and D.W.Walters: Managing the Supply Chain, Macmillan, 2008
12. Rangaraj: Supply chain Management for competitive advantage, TMH, 2009
13. Kachru: Logistics and Supply Chain Management, Excel, 2009
14. Shah: Supply Chain Management, Pearson, 2009

COURSE OUTCOMES

On completion of the course students will be able to

1. Analyse importance of managing and handling Logistical operation in an organization.
2. Develop the knowledge of supply chain strategies formulation and implementation.
3. Develop, implement and evaluate transportation networks.
4. Design and develop effective procurement and pricing strategies.
5. Manage effective relationship with the national and international channel members.

(C30162) KNOWLEDGE MANAGEMENT
(OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

Course Aim: The objective of the course is to provide the basics of the emerging area of Knowledge Management to students. This course through light on few important concepts as Knowledge management and Information Technology, Knowledge process, etc.

Unit I

The Knowledge Economy: Leveraging Knowledge, Data-Information-knowledge-Wisdom relationship, organizational knowledge, characteristics and components of organizational knowledge –Building knowledge societies- Measures for meeting the challenges of implementing KM programmes.

Unit II

Knowledge Management and Information Technology: Role Information Technology in Knowledge Management Systems, Knowledge Management tools,Creative effective Knowledge Management Systems through Information Technology, ERP and BPR, Data Warehousing and Data Mining.

Unit III

Future of Knowledge Management and Industry perspective: Companies on the road to knowledge management, Knowledge Management in Manufacturing and service industry, challenges and future of Knowledge Management.

Unit IV

The Knowledge Process: Universal appeal, Stages of KM Process, Knowledge Capital vs physical capital, Customer Relationship Management, Business Ethics And KM, The Promise of Internet and the Imperatives of the new age.

Unit V

Implementation of Knowledge Management: Discussion on Roadblocks to success,10-step KM Road Map of AmritTiwana, Business Intelligence and Internet platforms, web Portals, Information Architecture: A three-way Balancing Act, KM, the Indian experience, Net Banking in India. –Role of knowledge Management in

Organisational Restructuring. -The Mystique of a Learning Organisation.

References

1. Mattison: Web Warehousing & Knowledge Management, Tata McGraw-Hill,2009
2. Becerra Fernandez: Knowledge management: An Evolutionary view, PHI, 2009
3. Fernando:Knowledge Management, Pearson, 2009
4. B.Rathan Reddy: Knowledge management, Himalaya, 2009
5. Tapan K Panda: Knowledge Management, Excel, 2009.
6. Barnes: Knowledge Management systems, Cengage, 2009.
7. Tiwana: The Knowledge Management tool kit, 2/e, Pearson Education, 2009.
8. Warier: Knowledge Management, Vikas Publishing House, 2009
9. Sislop: Knowledge Management, Oxford University Press, New Delhi, 2009
10. Debowski: Knowledge Management, Wiley Student Edition, Wiley India, 2007

COURSE OUTCOMES

On completion of the course students will be able to:

1. Understanding the key theories and models in knowledge management.
2. Critically apply theory to organisations in order to identify and justify effective knowledge management strategies and activities.
3. Access and evaluate information research findings relating to knowledge management.
4. Communicate clearly and effectively incorporating various knowledge management formats and technologies.
5. Implement the ethical implications in managing knowledge.

(C30163) MANAGEMENT OF INDUSTRIAL RELATIONS (OPEN ELECTIVE)

B. Tech. ECE

L	T	P	C
3	0	0	3

(Students must read text book. Faculty are free to choose any other cases)

Course Aim: The aim of the course is to enable HR elective students develop awareness towards labour laws. The students will understand how to deal with legal problems emanating from employer and employee relations in organizations.

Learning Outcome: The student understands the industrial relations, its importance in HR and various Labour Laws like Factories Act, Wage and Bonus Act and Dispute Preventive and Corrective Mechanisms. They will also understand the role of Trade Unions, Settlement of disputes, Collective Bargaining, Wage Policy.

Unit I:

Industrial Relations: Introduction, concepts, importance of Industrial relations, scope and aspects of industrial relations, the management, the government factors affecting industrial relations, evolution of industrial relations policy, the industrial policy resolution 1991.

Unit II:

Anatomy of Industrial disputes and resolutions-I: industrial disputes , classification, causes, tripotisim, bipotism Tripartite and Bipartite Bodies, Standing orders and Grievance Procedure.

Unit III:

Anatomy of Industrial disputes and resolutions-II: Collective Bargaining, Conciliation, Arbitration, Adjudication, The Industrial Dispute Act 1947, Labour Welfare work, Labour Welfare officer, Worker's Participation.

Unit IV:

Industrial relations legislation-I: Wage Policy and Wage Regulation Machinery, Wage Legislation, Payment of Wages Act 1936, The Payment of Bonus Act,1965, Minimum wages Act-1948.

Unit V:

Industrial relations legislation-II: The Factories Act 1948, Mines Act 1952, Industrial Relations and Technological Change.

Journals: Indian Journal of Industrial Relation; NHRD Journal of Career Management; Management and Labour Studies; Personnel today; Leadership excellence; Indian Journal of Training & Development.

References:

1. Mamoria, Mamoria, Gankar "Dynamics of Industrial Relations" Himalaya Publishing House.2012.
2. Dr K S Anandram "Cases in Personnel Management Industrial Relations and Trade Relations" Everest, 2012.
3. ArunMonappa,RanjeetNambudiri,Selvaraj " Industrial Relations and Labour Laws" , TMH,2012
4. A.M.Sharma "Industrial Relations and Labour Laws", Himalaya Publishing House,2013.
5. Ratna Sen "Industrial Relations-Text and cases "Macmillan Publishers,2011.
6. Kubendran.V,Kodeeswari.K "Industrial Relations and Labour Laws "Himalaya Publishing House,2011.
7. PunekarS.D,Deodhar S.B, SaraswathiSankaren"LabourWelfare,Trade Unionism and Industrial Relations, "Himalaya Publishing House,2012.
8. B.D.Singh "Industrial Relations"Excel Books 2008.
9. S C Srivastava "Industrial Relations and Labor Laws" Vikas, 2012.
10. Padhi" Labour and Industrial Relations" PHI, 2012.
11. VenkataRatnam "Industrial Relations" Oxford, 2012.

COURSE OUTCOMES

On completion of the course students will be able to:

1. Access the concept and Scope of Industrial Relations and its resolution.
2. Outline the knowledge towards Trade unions, Industrial disputes and Grievance Procedure.
3. Identify various Laws on Wages, Welfare and Social Security.
4. Illustrate rules and regulations of working conditions.
5. Enlighten on quality standards in industry.

(C30164) ENTREPRENEURSHIP
(OPEN ELECTIVE)

B. Tech. ECE

L	T	P	C
3	0	0	3

Aim: The aim of this subject is to inspire students to become entrepreneurs so that they will emerge as job providers rather than job seekers.

Learning Outcome: By the end of this course the students should be able to understand the mindset of the entrepreneurs, identify ventures for launching, develop an idea on the legal framework and also understand strategic perspectives in entrepreneurship.

Unit I:

Understanding Entrepreneurial Mindset- The revolution impact of entrepreneurship- The evolution of entrepreneurship- Approaches to entrepreneurship- Process approach- Twenty first centaury trends in entrepreneurship.

Unit II:

The individual entrepreneurial mind-set and Personality- The entrepreneurial journey- Stress and the entrepreneur- the entrepreneurial ego- Entrepreneurial motivations. Corporate Entrepreneurial Mindset- the nature of corporate entrepreneur-conceptualization of corporate entrepreneurship Strategy-sustaining corporate entrepreneurship.

Unit III:

Launching Entrepreneurial Ventures- opportunities identification-entrepreneurial Imagination and Creativity- the nature of the creativity process-Innovation and entrepreneurship. Methods to initiate Ventures-Creating new ventures-Acquiring an Established entrepreneurial venture- Franchising-hybrid- disadvantage of Franchising.

Unit IV:

Legal challenges of Entrepreneurship-Intellectual property protection-Patents, Copyrights-Trade marks and Trade secrets-Avoiding trademark pitfalls. Formulation of the entrepreneurial Plan-The challenges of new venture start-ups, Poor financial Understanding-

Critical factors for new venture development-The Evaluation process-Feasibility criteria approach.

Unit V:

Strategic perspectives in entrepreneurship- Strategic planning-Strategic actions- strategic positioning-Business stabilization- Building the adaptive firms-Understanding the growth stage-Unique managerial concern of growing ventures.

Journal:

- **The Journal of Entrepreneurship,** Entrepreneurship Development Institute of India, Ahmedabad
- **Journal of Human Values**: IIM Calcutta.

References:

1. D F Kuratko and T V Rao “Entrepreneurship- A South-Asian Perspective “Cengage Learning, 2012. **(For PPT, Case Solutions Faculty may visit : login.cengage.com)**
2. Vasant Desai “Small Scale industries and entrepreneurship” Himalaya publishing 2012.
3. Rajeev Roy “Entrepreneurship” 2e, Oxford, 2012.
4. B.Janakiram and M.Rizwana” Entrepreneurship Development :Text& Cases, Excel Books,2011.
5. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
6. Robert Hisrich et al “Entrepreneurship” 6th e, TMH, 2012.
7. Nandan H, Fundamentals of Entrepreneurship, PHI, 2013
8. Shejwalkar, Entrepreneurship Development, Everest, 2011
9. Khanka, Entrepreneurship Development, S.Chand, 2012

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Identify the Qualities, requirements, Risk & Ethical issues to become an Entrepreneur.
2. Analyze and develop the conceptualization of corporate Entrepreneurship.
3. Explore different possibilities to start an Enterprise for young Entrepreneurs.
4. Outline challenging benchmarks for formulation of Entrepreneurship.
5. Evaluate the application of Strategic action for growing ventures.

(C30165) BASICS OF INSURANCE & TAXATION (OPEN ELECTIVE)

L	T	P	C
3	0	0	3

B.Tech ECE

(Students must read text book. Faculty are free to choose any other cases)

Course Aim: To provide the basic concepts of Income Tax.

Learning Outcome: The Objective of the course is to provide the candidates with sound knowledge of the important provisions of the Income Tax law and their applications.

Unit I: Introduction to Life Insurance and General Insurance : Introduction to Life Insurance - Principles of Life Insurance - Life insurance products, pensions and annuities , Introduction to General Insurance. Principles of General Insurance. Types of General Insurance - Personal general insurance products (Fire, Personal Liability, Motors, Miscellaneous Insurance). Terminology, clauses and covers.

Unit II:Claim Management & Re-Insurance : Claim Management - Claim Settlement - Legal Framework - Third party Administration, Insurance ombudsman - Consumer Protection Act - Re-Insurance in Life Insurance - Retention Limits - Methods of Re-insurance.

Unit III: General Perspectives and Income Tax rate Structure: Historical background of Taxation Laws in India, Fundamental Principles of Income Tax and concepts, Government Financial Policies regarding Taxation. Tax structure and its Role in Indian Economy, Residential Status, Non Resident persons & Non Ordinary Resident, Previous year and Assessment year Tax: Fees and cess, Capital Expenditure and Capital Income. Revenue Expenditure and Revenue Income, Tax Evasion and Tax Avoidance,Direct and Indirect Taxes.

Unit IV:

Heads and Sources of Income and Exemptions & Deductions under the Income Tax: Salary and Fringe Benefit Tax, Income from House Property, Income from Business; Profession or Vocation, Capital Gains, Income from other sources. (Theory only), Exemptions & Deductions under the Income Tax Act,Income exempt u/s 10 of the I.T. Act, Permissible deductions under Chapter VI of I.T. Act, Relief, Double Taxation Relief.

Unit V:

Assessment Procedures:PAN AND TAN, Filing of return and e-filling, Advance payment of Tax, Tax deduction at source, Tax Collection at Source, Refund of Tax, and Types of Assessment. Computation of Income in Individuals

Reference:

1. Mishra M.N: Insurance Principles and Practice; S.Chand and Co. New Delhi.
2. Principles of Life Insurance: Dr.ShrikrishanLaxmanKarve, Himalaya
3. Insurance: Theory & Practice: Tripathy& Pal, PHI
4. Taxation: H.Prem raja - Sri Hamsrala publications
5. Direct Taxes &Practice :Dr. V K Singhania, Taxman Publications.
6. Gour and Narang - Income Tax Law and Practice, Kalyani Publication
7. Practicals in Taxation: H.Prem raja - Sri Hamsrala publications.
8. Income Tax: B.B. Lal, Pearson Education
9. Taxation: R.G. Saha, Himalaya Publishing House Pvt. Ltd
10. Income Tax: Johar, McGraw Hill Education
11. Taxation Law and Practice: Balachandran &Thothadri, PHI Learning

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Explain the basic legal concepts and general principles of Insurance&Tax.
2. Implement claim management and settlement.
3. Prepare tax assessments, computation of individual Incomes
4. Analyse tax exemptions and deductions of income tax.
5. Explain the procedure for filing e-filing Tax, ITDS, PAN & TAN.

(C30166) BUSINESS ETHICS & CORPORATE GOVERNANCE (OPEN ELECTIVE)

B.Tech ECE

L	T	P	C
3	0	0	3

Course Aim: The aim of this subject is to inculcate the need for business ethics to ensure sustained business stability.

Learning outcome: The learning outcome developing business ethics and professional ethics. They will also be able to understand ethical and psychological dimensions to contain cybercrimes and also will be able grasp the important issues related to corporate governance.

Unit I

Business Ethics The Changing Environment: Business Ethics-why does it matter?; Levels of Business Ethics-Five Myths about Business Ethics- Can Business Ethics be Taught and Trained?; stages of Moral development, Kohlberg's study- Carol Gilligan's Theory-Principles of Ethics.

Unit II

Professional Ethics. Introduction to Professional Ethics- Ethics in Production and Product Management-Ethics of Marketing Professionals-Ethics in HRM-Ethics of Finance and Accounting Professionals-Ethics of Advertisement-Ethics of Media Reporting-Ethics of Healthcare Services. Ethical Dilemma. Introduction, Dilemma and Ethical Dilemma-Mounting Scandals-Ethical Issues-Preparatory Ethics: Proactive steps-The software challenge.

Unit III

Cyber crimes and cyber Terrorism-social,Political, ethical and psycological , dimensitional , Intellectual properrty in the cyberspace,Ethical dimenstions of cyber crimes-the psycology, mindset & Skills of Hackers & Other cyber criminals, Sociology of cyber criminals, inforamtion Warfare.

Unit IV

Corporate Governance I: Does Good Governance Really matters to Corporations?-Importance of corporate Governance –Corporate Governance in India-Board Structures Processes and Evaluation-Director Independence –Board committees, Indian model of Corporate Governance.

Unit V

Corporate Governance-II: Information communication and Disclosure-Irani Committee Report-OECD Principles of Corporate Governance –Risk, Internal Control and Assurance-Banks and Corporate Governance.

References:

1. SK Mandal: Ethics in Business and Corporate Governance, TMH, 2/e, 2012. Journal of Human Values: IIM Calcutta. SAGE.
2. Archie. B Carroll, Business Ethics-Brief Readings on Vital Topics, Routledge, 2013.
3. A.C.Fernando: Corporate Governance, Principles, Policies and Practices, Pearson, 2012.
4. C.S.V.Murthy: Business Ethics, Himalaya Publishing House, 2012.
5. N.Balasubramanian : Corporate Governance and Stewardship, TMH,2012.
6. Nina Godbole & Sunit Belapure " Cyber Security" wiley india 2012.
7. Joseph W.Weiss : Business Ethics, Thomson, 2006.
8. Geethika,RK Mishra, Corporate Governance Theory and Practice,Excel,2011.
9. Dr.S.S.Khanka, Business Ethics and Corporate Governance, S.Chand, 2013.
10. K.PraveenParboteeach, Business Ethics, Routledge, 2013.
11. Praveen B Malla, Corporate Governance, Routledge 2010.
12. H.C.Mruthyunjaya, Business Ethics and Value Systems, PHI, 2013
13. V Balachandram, V Chandrasekaran, Corporate Governance, Ethics and Social Responsibility, PHI, 2011
14. Khanka, Business Ethics and Corporate Governance, S.Chand, 2013

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Identify the concept and principles of Business ethics
2. Analyze the importance of Professional Ethics and relate Ethical Dilemma to Business Practices
3. Outline the factors of Cybercrime and Cyber Terrorism.
4. Predict stakeholder's roles in corporate Governance.
5. Review committee Reports on development of Corporate Governance.

(C30167) Marketing Management
(Open Elective)

B.Tech ECE

L	T	P	C
3	0	0	3

The Objective of the course is to have the basic concepts of Marketing which is one of the important areas of functional management.

Unit I

Understanding Marketing Management: Concepts of Marketing, Marketing Strategies & Plans, Creating long term Loyalty relationships, Marketing mix, Product Life Cycle.

Unit II

Connecting with Customers & Building Strong Brands: Analyzing Competitors, Conducting Marketing Research, Consumer Behaviour, Identifying market segments and targets, crafting Brand Positioning.

Unit III

New Product and Promotions: Introducing New Market Offering, Developing Pricing Strategies &Programmes, Designing & Managing Integrated Marketing Communications, Advertising & Sales Promotions, Managing Digital Communication – Online, Social Media & Mobile, Personal Selling.

Unit IV

Delivering Value: Managing Retailing, Wholesaling and logistics, Designing and Managing Integrated Marketing Channels.

Unit V

Sales Management: Nature and Importance of Sales Management, Skills of Sales Manager, Sales objectives, Concepts of Sales organization, Type of Sales organization.

Text books:

1. Marketing Management, Philip Kotler, Kevin Lane Keller, Pearson

References:

1. Marketing, A south Asian prospective, Lamb, Hair, Sharma, Mcdaniel, Cenage
2. Marketing Asian Edition Paul Baines Chris Fill Kelly Page, Oxford
3. Marketing Management 22e, Arun Kumar, Menakshi, Vikas Publishing

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Analyze the scope, concepts of Marketing and forecasting techniques in present Global Market Environment.
2. Develop conceptual knowledge on consumer behavior, Marketing Mix and Product Mix
3. Outline Segmentation, targeting and Positioning Goods and Services in Market.
4. Illustrate marketing channels of distribution and Promotional mix
5. Identify Pricing Decisions and importance of digital Marketing.

(C30168) INTELLECTUAL PROPERTY RIGHTS
(Open Elective)

B.Tech ECE

L	T	P	C
3	0	0	3

The Objective of the course is to have the basic concepts of Intellectual Property Rights through which a firm/individual can protect its existence through its uniqueness.

UNIT-I: INTRODUCTION TO INTELLECTUAL PROPERTY: Introduction, types of intellectual property, international Organizations, agencies and treaties, importance of intellectual property rights.

UNIT-II: TRADE MARKS:

Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, Selecting and evaluating trade mark, trade mark registration processes.

UNIT-III: LAW OF COPY RIGHTS:

Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right owner ship issues, copy right registration, notice of copy right , international copy right law.

Law of Patents: Foundation of patent law, patent searching process, owner rights and transfer.

UNIT-IV: TRADE SECRETS:

Trade secret law, determination of trade secrete status' liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

UNFAIR COMPETITION: Misappropriation right of publicity, false advertising

UNIT-V: NEW DEVELOPMENT OF INTELLECTUAL PROPERTY:

New developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international-trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT BOOKS & REFERENCES

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, PrabuddhaGanguli, Tata Mc Graw Hill Publishing Company Ltd.

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Skill to understand the concept of intellectual property rights.
2. Develops procedural knowledge to Legal System and solving the problem relating Patents.
3. Gain knowledge on development and owning of Trade Marks, Copy Rights, and Patents.
4. Develops conceptual exposure on legal aspects related to IPR
5. Knowledge on different types of competition and ethical and unethical practices of advertising.