

**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 from 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) Bachelor of 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 candidates 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-B seats 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:

- Foundation Courses (Fn C)
- Core Courses (Co C)
- Elective Courses (El C)

- **Foundation Courses** (Fn C) are further categorized as :
  - HSMC (Humanities, Social Sciences and Management Courses)
  - BSC (Basic Science Courses)
  - ESC (Engineering Science Courses)
- **Core Courses** (Co C) and **Elective Courses** (El C) are categorized as PS (Professional Subjects), which are further subdivided as –
  - PCC (Professional Core Courses)
  - PEC (Professional Elective Courses)
  - OEC (Open Elective Courses)
  - 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:

<i>S. No.</i>	<i>Broad Course Classification-</i>	<i>Course Group/ Category</i>	<i>Course Description</i>	<i>Suggested Breakup of Credits by</i>
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	<i>on</i>			<i>AICTE(160)</i>
1	<b>Foundation Courses (Fn C)</b>	<b>BSC – Basic Science Courses</b>	Includes - Mathematics, Physics and Chemistry Subjects	<b>25*</b>
2		<b>ESC - Engineering Science Courses</b>	Includes fundamental engineering subjects	<b>24*</b>
3		<b>HSMC – Humanities and Social Sciences including Management Courses</b>	Includes subjects related to Humanities, Social Sciences and Management	<b>12*</b>
4	<b>Core Courses (Co C)</b>	<b>PCC– Professional Core Courses</b>	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engg.	<b>48*</b>
5	<b>Elective Courses (El C)</b>	<b>PEC – Professional Elective Courses</b>	Includes Elective subjects related to the Parent Discipline/ Department/ Branch of Engg.	<b>18*</b>
6		<b>OEC – Open Elective Courses</b>	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department/ Branch of Engg.	<b>18*</b>
7	<b>Core Courses</b>	<b>Project</b>	B.Tech. Project or UG Project or UG Major Project	<b>15*</b>
8		<b>Industrial Training/ Mini-Project</b>	Industrial Training/ Internship/ UG Mini-Project/ Mini-Project	
9		<b>Seminar</b>	Seminar/ Colloquium based on core contents related to Parent Discipline/ Department/ Branch of	

			Engg.	
10		<b>Mandatory Courses (MC)</b>	Mandatory Courses (non-credit)	<b>Nil</b>
<b>Total Credits for B. Tech. Programme</b>				<b>160</b>

\* 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.

- 8.6A** 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 be two internal examinations in 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 One OE-I and one OE-II during VII Semester, one OE-III and one OE-IV in VIII Semester from the list of Open Electives given. However, Students cannot opt for an Open Elective Course offered by their own (parent) Department, if it is already listed under any category of the Courses offered by parent Department in any Semester. 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.

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## **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 ...

<i>% of Marks Secured (Class Intervals)</i>	<i>Letter Grade (UGC Guidelines)</i>	<i>Grade Points</i>
100% or below but not less than 85% ( $\geq 85\%$ , $\leq 100\%$ )	<b>O (Excellent)</b>	<b>10</b>
Below 85% but not less than 70% ( $\geq 70\%$ , $< 85\%$ )	<b>A (Very Good)</b>	<b>9</b>
Below 70% but not less than 60% ( $\geq 60\%$ , $< 70\%$ )	<b>B (Good)</b>	<b>8</b>
Below 60% but not less than 55% ( $\geq 55\%$ , $< 60\%$ )	<b>C (above Average)</b>	<b>7</b>
Below 55% but not less than 50% ( $\geq 50\%$ , $< 55\%$ )	<b>D (Average)</b>	<b>6</b>
Below 50% but not less than 40% ( $\geq 40\%$ , $< 50\%$ )	<b>P (Pass)</b>	<b>5</b>
Below 40% ( $< 40\%$ )	<b>F (FAIL)</b>	<b>0</b>

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  $\geq$  5 (P Grade or above).

- 11.7. The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points ( $\Sigma$ CP) 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

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

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  $i^{\text{th}}$  Course, and  $G_i$  represents the Grade Points (GP) corresponding to the Letter Grade awarded for that  $i^{\text{th}}$  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

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

(ie., upto and inclusive of S Semesters,  $S \geq 2$ ),

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 1<sup>st</sup> 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<sup>th</sup> Course, and  $G_j$  represents the Grade Points (GP) corresponding to the Letter Grade awarded for that j<sup>th</sup> 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  $\geq 5.00$  (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  $\geq 5.00$ ; subject to the condition that he secures a GP  $\geq 5$  (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 ...

$$\% \text{ of Marks} = (\text{final CGPA} - 0.5) \times 10$$

### **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  $\geq$  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)  $\geq$  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  $\geq$  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)  $\geq 8.00$  , but not fulfilling the above conditions shall be placed in 'FIRST CLASS'.

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

(d) Students with final CGPA (at the end of the UG PROGRAMME)  $\geq 5.50$  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)  $\geq 5.00$  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.

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**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 candidates 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 forfeit their seats.
- 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% of average credits) up to III Year II Semester from all the examinations, whether or 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 within six academic years from the year of their admissions shall forfeit their seat in B.Tech. Course and their admission stand 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

	<b>Nature of Malpractices/ Improper conduct</b>	<b>Punishment</b>
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 communicates through cell phones with any candidate or persons	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 over to the police and a case is registered against him.

	in or outside the exam hall in respect of any matter.	
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 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.	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.

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 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 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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**I SEMESTER**

Course Code	Category	Course	L	T	P	C
A30004	BSC	Linear Algebra and Calculus	3	1	0	4
A30009	BSC	Applied Physics	3	1	0	4
A30501	ESC	Programming for Problem Solving	3	0	0	3
A30313	ESC	Engineering Drawing	1	0	3	2.5
A30023	BSC	Applied Physics Lab	0	0	3	1.5
A30502	ESC	C Programming Lab	0	0	3	1.5
A30505	ESC	Basic Internet of Things Lab	0	0	2	1
A30020	HSMC	Introduction to Social Innovation	0	0	2	1
<b>Total:</b>			<b>10</b>	<b>2</b>	<b>13</b>	<b>18.5</b>

**II SEMESTER**

Course Code	Category	Course	L	T	P	C
A30001	HSMC	English	2	0	0	2
A30005	BSC	ODEs and Multivariable Calculus	3	1	0	4
A30011	BSC	Engineering Chemistry	3	0	0	3
A30503	ESC	Data Structures & Algorithms	3	0	0	3
A30002	HSMC	English Language Communication Skills Lab	0	0	3	1.5
A30012	BSC	Engineering Chemistry Lab	0	0	3	1.5
A30504	ESC	Data Structures & Algorithms Lab	0	0	3	1.5
A30314	ESC	Engineering Workshop	0	0	3	1.5
A30019	BSC	Engineering Exploration & Practice	0	0	3	1.5
<b>Total:</b>			<b>11</b>	<b>1</b>	<b>15</b>	<b>19.5</b>

**III SEMESTER**

Course Code	Category	Course	L	T	P	C
A30006	BSC	Numerical Methods & Complex Variables	3	1	0	4
A30201	PCC	Network Theory-I	3	0	0	3
A30202	PCC	Electro Magnetic Fields	3	0	0	3
A30401	PCC	Electronic Devices & Circuits	3	0	0	3
A30182	ESC	Fluid Mechanics & Hydraulic Machinery	3	0	0	3
A30203	PCC	Electrical Machines -I	3	0	0	3
A30404	PCC	Electronic Devices & Circuits Laboratory	0	0	3	1.5
A30113	ESC	Fluid Mechanics & Hydraulic Machinery Laboratory	0	0	3	1.5
A30016	MC	Gender Sensitization	0	0	2	0
<b>Total</b>			<b>18</b>	<b>1</b>	<b>8</b>	<b>22</b>

**IV SEMESTER**

Course Code	Category	Course	L	T	P	C
A30204	PCC	Power Systems-I	3	0	0	3
A30205	PCC	Electrical Machines-II	3	0	0	3
A30206	PCC	Network Theory-II	3	0	0	3
A30405	PCC	Signals & Systems	3	0	0	3
A30403	PCC	Switching Theory & Logic Design	3	0	0	3
A30207	PCC	Electrical Machines-I Laboratory	0	0	3	1.5
A30208	PCC	Electrical Networks Laboratory	0	0	3	1.5
A30021	HSMC	Social Innovation in Practice	0	0	2	1
A30015	MC	Soft Skills & Professional Ethics	0	0	2	0
A30022	MC	NCC/NSS	0	0	2	0
<b>Total</b>			<b>15</b>	<b>0</b>	<b>12</b>	<b>19</b>

## V SEMESTER

Course Code	Category	Course	L	T	P	C
A30209	PCC	Control Systems	3	0	0	3
A30210	PCC	Power Electronics	3	0	0	3
A30211	PCC	Power Systems-II	3	0	0	3
A30212	PCC	Power System Protection	2	1	0	3
A30213	PCC	Electrical Measurements	3	0	0	3
<b>PEC-I</b>	<b>PEC-I</b>	<b>PROFESSIONAL ELECTIVE-I</b>	3	0	0	3
A30247		Optimization Techniques				
A30232		Electrical Instruments				
A30233		Electric Smart Grid Technologies				
A30214	PCC	Electrical Machines-II Lab	0	0	3	1.5
A30215	PCC	Control Systems & Simulation Lab	0	0	3	1.5
A30017	MC	Indian Constitution	2	0	0	0
A30018		Essence of Indian Traditional Knowledge				
<b>Total</b>			<b>19</b>	<b>1</b>	<b>6</b>	<b>21</b>
A30261	MC	Mini project-I	During summer vacation /Non Credit			
A30262		Internship-I				

## VI SEMESTER

Course Code	Category	Course	L	T	P	C
A30013	HSMC	Business Management & Financial Analysis	4	0	0	4
A30421	PCC	Microprocessors & Microcontrollers	3	0	0	3
A30216	PCC	Computer Methods in Power Systems	3	0	0	3
A30217	PCC	Power Semiconductor Drives	3	0	0	3
<b>PEC-II</b>	<b>PEC-II</b>	<b>PROFESSIONAL ELECTIVE-II</b>	3	0	0	3
A30234		Electrical Distribution Systems				
A30235		Non-Conventional Energy Sources				

A30236		Digital Control Systems				
A30003	HSMC	Advanced English Communications Skills Lab	0	0	3	1.5
A30218	PCC	Power Electronics & Simulation Lab	0	0	3	1.5
A30014	MC	Environmental Sciences	2	0	0	0
A30263	PROJ	Technical Seminar-I	2	0	0	2
<b>Total</b>			<b>20</b>	<b>0</b>	<b>6</b>	<b>21</b>

**VII SEMESTER**

Course Code	Category	Course	L	T	P	C
<b>PEC-III</b>	<b>PEC-III</b>	<b>PROFESSIONAL ELECTIVE-III</b>	3	0	0	3
A30237		HVDC Transmission				
A30238		Power System Operation & Control				
A30239		Switched Mode Power Supply				
<b>PEC-IV</b>	<b>PEC-IV</b>	<b>PROFESSIONAL ELECTIVE-IV</b>	3	0	0	3
A30240		High Voltage Engineering				
A30241		Power Quality				
A30242		Utilization of Electrical Energy				
<b>PEC-V</b>	<b>PEC-V</b>	<b>PROFESSIONAL ELECTIVE-V</b>	3	0	0	3
A30243		FACTS DEVICES				
A30244		Reliability Engineering				
A30245		Advanced Electrical Drives				
<b>OE-I</b>	<b>OE-I</b>	<b>OPEN ELECTIVE-I</b>	3	0	0	3
<b>OE-II</b>	<b>OE-II</b>	<b>OPEN ELECTIVE-II</b>	3	0	0	3
A30219	PCC	Electrical Measurements Lab	0	0	3	1.5
A30422	PCC	Microprocessors & Microcontrollers Lab	0	0	3	1.5
A30267	PROJ	Major Project Phase-I	0	0	6	3
<b>Total</b>			<b>15</b>	<b>0</b>	<b>24</b>	<b>21</b>
A30264	MC	Mini project-II	During summer vacation /Non Credit			
A30265		Internship-II				

**VII SEMESTER**

Course Code	Category	Course	L	T	P	C
<b>PEC-VI</b>	<b>PEC-VI</b>	<b>PROFESSIONAL ELECTIVE-VI</b>	3	0	0	3
A30246		Electrical Energy Conservation & Auditing				
A30231		AI Techniques in Electrical Engineering				
A30413		Digital Signal Processing				
<b>OE-III</b>	<b>OE-III</b>	<b>OPEN ELECTIVE-III</b>	3	0	0	3
<b>OE-IV</b>	<b>OE-IV</b>	<b>OPEN ELECTIVE-IV</b>	3	0	0	3
A30266	PROJ	Technical Seminar-II	2	0	0	2
A30268	PROJ	Major Project Phase-II	0	0	1 4	7
	<b>Total</b>		<b>11</b>	<b>0</b>	<b>1 4</b>	<b>18</b>

**Open Elective-I**

Course Code	Course Title	Category	L	T	P	C
A30471	Principles of Electronic Communications	OE-I	3	0	0	3
A30472	Basic Electronics Engineering	OE-I	3	0	0	3
A30554	Java Programming	OE-I	3	0	0	3
A30531	Python Programming	OE-I	3	0	0	3
A30383	Fundamentals of Engineering Materials	OE-I	3	0	0	3
A30377	Basics of Thermodynamics	OE-I	3	0	0	3
A30160	Disaster Management And Mitigation	OE-I	3	0	0	3
A30161	Remote Sensing and GIS	OE-I	3	0	0	3
C30161	Logistics and Supply Chain Management	OE-I	3	0	0	3
C30162	Knowledge Management	OE-I	3	0	0	3

**Open Elective-II**

Course Code	Course Title	Category	L	T	P	C
A30473	Image Processing	OE-II	3	0	0	3
A30474	Digital Electronics	OE-II	3	0	0	3
A30555	Introduction To Database Management Systems	OE-II	3	0	0	3
A30537	Data Analytics With R	OE-II	3	0	0	3
A30357	Fundamentals of Manufacturing Processes	OE-II	3	0	0	3
A30379	Fundamentals of Automobile Engineering	OE-II	3	0	0	3
A30162	Green Buildings	OE-II	3	0	0	3
A30163	Air Pollution and Control	OE-II	3	0	0	3
C30163	Management of Industrial Relations	OE-II	3	0	0	3
C30164	Entrepreneurship	OE-II	3	0	0	3

**Open Elective-III**

Course Code	Course Title	Category	L	T	P	C
A30475	Data Communications	OE-III	3	0	0	3
A30476	Micro Controllers & Applications	OE-III	3	0	0	3
A30530	Artificial Intelligence	OE-III	3	0	0	3
A30539	Ethical Hacking	OE-III	3	0	0	3
A30382	Fundamentals of Mechanical Engineering	OE-III	3	0	0	3
A30378	Waste to Energy	OE-III	3	0	0	3
A30164	Basic Civil Engineering	OE-III	3	0	0	3
A30165	Sustainability Concepts in Civil Engineering	OE-III	3	0	0	3
C30165	Basics of Insurance & Taxation	OE-III	3	0	0	3
C30166	Business Ethics & Corporate Governance	OE-III	3	0	0	3

**Open Elective-IV**

Course Code	Course Title	Category	L	T	P	C
A30477	Fundamentals Of Embedded Systems	OE-IV	3	0	0	3
A30478	Sensors & Transducers	OE-IV	3	0	0	3
A30538	Deep Learning	OE-IV	3	0	0	3
A30556	Cyber Security	OE-IV	3	0	0	3
A30358	Industrial Safety Engineering	OE-IV	3	0	0	3
A30360	Work System Design	OE-IV	3	0	0	3
A30166	Environmental Protection and Management	OE-IV	3	0	0	3
A30167	Alternate Building Materials	OE-IV	3	0	0	3
C30167	Marketing Management	OE-IV	3	0	0	3
C30168	Intellectual property rights	OE-IV	3	0	0	3





**(A30004) LINEAR ALGEBRA AND CALCULUS**

(Common to all branches)

<b>B.Tech (EEE): I Semester</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**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****Sequences & Series :**

**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, (36<sup>th</sup> Edition), B.S. Grewal, Khanna Publishers, 2010
2. Advanced Engineering Mathematics, (9<sup>th</sup> 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, (9<sup>th</sup> 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, (11<sup>th</sup> 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 (3<sup>rd</sup> edition) by Pipes & Harvill, McGraw Hill International 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 perform 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.

**(A30009) APPLIED PHYSICS**  
**(ECE, EEE, CSE)**

**B.Tech (EEE): I Semester**

L	T	P	C
3	0	1	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., 1<sup>st</sup> Edition, 2012.
2. Engineering Physics by PK Palanisamy, SciTech Publications, 3<sup>rd</sup> edition, 2015.

#### REFERENCES

1. Fundamentals of Physics by Halliday, R. Resnick and J. Walker, John Wiley and Sons, 6<sup>th</sup> edition, 2001.
2. Introduction to Quantum Physics by Eisberg and Resnick, John Wiley & Sons, 2<sup>nd</sup> 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.MSze 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.
3. Illustrate different semiconductor devices.
4. Interpret the basic properties of lasers and characteristics of optical fibers.
5. Classify various polarization processes in solids & different dielectric materials
6. Describe different types of magnetic materials & illustrate the basic principles of superconductivity.
7. Illustrate the basic principles of superconductivity.

**(A30501)PROGRAMMING FOR PROBLEM SOLVING**

<b>B.Tech (EEE): I Semester</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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.
6. Perform searching and sorting.

**(A30313) ENGINEERING DRAWING****B.Tech (EEE): I Semester****L T P C**  
**1 0 3 2.5****Unit – I**

Introduction to Engineering Drawing: Principles of Engineering drawing and their Significance; Conic Sections (Using eccentricity method only) Cycloid, Epicycloid 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. Understand and apply the use of engineering curves in tracing the part of different machine components.
2. Evaluate the concepts of projections and acquire knowledge of visualization skills and convert it into pictorial representation.
3. Create and analyze the 3-D objects of machine components in real world.
4. Explore and evaluate the internal architecture of product by section and development of surfaces.
5. Create and imagine the solid and real objects in real world with axonometric projection.

**(A30023)APPLIED PHYSICS LAB****B.Tech (EEE): I 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.VenkateswaraRao (V.G.S Publishers).
2. Laboratory Manual of Engineering, 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, Planck's constant and magnetic fields.
- ~~3.~~ Describe the characteristics of semiconductor devices.
4. Design new experiments in engineering.
5. Evaluate the basic properties of lasers and optical fibers.

**(A30502) C PROGRAMMING LAB****B.Tech (EEE): 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**

1. Write & Execute programs using C language Syntax.
2. Correct syntax errors for a given program as reported by the C-Compiler.
3. Develop the real world applications using Arrays, Structures in C and test the applications by



execution.

4. Demonstrate the usage of various types of pointers in programs by execution in C.

5. Create, read and write to and from simple text and binary files and verify through execution.

**(A30505) BASIC INTERNET OF THINGS LAB****B.Tech (EEE): I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**Lab Requirements:**

Raspberry Pi3 single board Computer/Arduino Uno Boards, 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 / Arduino**

- 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 Dependant Resistor(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.
- Create Hello World application with Android.

### **Week 8**

- Create Application to change the Background Color and Background Image
- Explain simple User interface components in Android and create simple Application

### **Week 9**

- Create an application that display color or image as background when selected the radio buttons or checkboxes
- Create an Application to perform addition, Subtraction, multiplication, division.

### **Week 10**

- Explain what activity, intent and its functions is.
- Create an application with Android intent.

### **Week 11**

Create a simple android application with the following event handlers.

- On Click
- On Key Down
- On Focus changed

### **Week 12**

- Explain about Toast, Create Application with User defined Toast Notifications.
- Create login page by using login activity.

### **Reference Books:**

1. Arshdeep Bahga, Vijay Madiseti, 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 (EEE): I Semester**

LTPC

0 0 2 1

**UNIT 1**

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

**UNIT 2**

**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 3**

**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 4**

**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 5**

Steps for Patent 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, Yeheskel Hasenfeld; 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. Illustrate the factors affecting social innovation
2. Illustrate the impact of social innovation in various sectors
3. Adopt the ethical values in doing innovation, which leads to betterment of society.

**(A30001) ENGLISH****B.Tech (EEE): II Semester**

L	T	P	C
2	0	0	2

**UNIT-I:**

Reading: **On the Conduct of Life: William Hazlitt** from “**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 Heasley. 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 OUTCOME:**

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

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

**(A30005) ODEs AND MULTIVARIABLE CALCULUS**

(Common to all branches)

**B.Tech (EEE): 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<sup>th</sup> Edition), B.S. Grewal, Khanna Publishers, 2010
2. Advanced Engineering Mathematics, (9<sup>th</sup> 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<sup>nd</sup>Edi) by George F Simmons, [Tata Mc. graw Hill Publishing Co Ltd.](#)
3. Advanced Engineering Mathematics(8<sup>th</sup> Edition) by Kreyszig, John Wiley & Sons Publishers
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry(9<sup>th</sup> Edition), Pearson, Reprint, 2002
5. Mathematics for Engineering and Scientists(6<sup>th</sup> 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.

**(A30011) ENGINEERING CHEMISTRY****L T P C**  
**3 0 0 3****B.Tech (EEE): II Semester****UNIT-I****Molecular Structure and Theories of Bonding:**

Introduction, Concept of atomic and molecular orbital's, Linear combination of atomic orbital's (LCAO), Molecular orbital's of diatomic molecules, Molecular orbital energy level diagrams of diatomic molecules-  $N_2$ ,  $O_2$  and  $F_2$ ,  $\pi$  –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. Fof the cell, Nerns't 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, Sterilisation, 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  $\text{KMnO}_4$  and chromic acid, Reduction reactions-reduction of carbonyl compounds using  $\text{LiAlH}_4$ ,  $\text{NaBH}_4$ , 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, 16<sup>th</sup> 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, 3<sup>rd</sup> edition, 1980.
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell, McGraw-Hill, 3<sup>rd</sup> revised 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, 5<sup>th</sup> Edition, 1994.
6. "Text Book of Engineering Chemistry", B.Rama Devi, Ch. Venkata Ramana Reddy and Prasanth Rath, Cengage Learning 2017.
7. "Organic Chemistry", Morison and Boyd, Pearson publications, 7<sup>th</sup> Edition 2011.
8. Organic Chemistry: Structure and Function by K.P.C. Vollhardt and N.E. Schore, 5<sup>th</sup> Edition  
<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.
3. Apply knowledge of corrosion science to address problems in materials engineering.
4. Explain various methods of prevention of corrosion of metals.
5. Explain chemical applications of electricity.
6. Analyze microscopic chemistry in terms of atomic and molecular orbitals.
7. List major chemical reactions that are used in the synthesis of drugs.

**(A30503) DATA STRUCTURES & ALGORITHMS****B.Tech (EEE): 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.

**(A30002) ENGLISH LANGUAGE****B.Tech (EEE): II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

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

**LEARNING OUTCOMES:** By the end of the course students will develop:

**COURSE OUTCOMES:**

At the end of the lab session, learner comprehends, acquaints and adopts the following.

1. Illustrates How to Work in Teams
2. Demonstrates Soft Skills and Communications Skills well and Exhibits Decorum with ease
3. Minimizes the usage of Mother Tongue and Apprises Neutral Accent
4. Prepares for employability skills
5. Speaks English Confidently and does Presentations with self-confidence
6. Distinguishes between Sympathy and Empathy
7. Demonstrates the art of persuasion

**(A30012)ENGINEERING CHEMISTRY LAB**

L T P C

0 0 3 1.5

**B.Tech (EEE): II Semester**

1. Estimation of Hardness of water by EDTA method.
2. Estimation of Alkalinity of water.
3. Estimation of Copper by Colorimetric Method.
4. Conductometric Titration of a strong acid vs a strong base.
5. Conductometric Titration of a weak acid vs a weak base.
6. Potentiometric Titration of a strong acid vs a strong base.
7. Potentiometric Titration of weak acid vs a weak base.
8. Preparation of Paracetamol and Aspirin.
9. Determination of Viscosity of a Liquid.
10. Determination of Surface Tension of a liquid.
11. Adsorption of acetic acid on Activated charcoal.
12. Estimation of iodine in table salt.
13. Thin Layer Chromatography (Ortho-Nitro phenol & Para-Nitro phenol).
14. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.

**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 Paracetamol
3. Estimate the strength of solutions,  $p^H$  of various solutions
4. Evaluate the viscosity and surface tension of liquids
5. Employ the conductometric and potentiometric titrations
6. Describe the principles of adsorption phenomenon.

**REFERENCES:**

1. Engineering Chemistry Lab Manual, Glaze Publishers 2018.

2. Engineering chemistry by B. Rama Devi & Ch. VenkataRamana Reddy; Cengage Learning, 2012.
3. A Textbook of Engineering Chemistry, Sashi Chawla, DhanapathRai& Sons.

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**(A30504) DATA STRUCTURES & ALGORITHMS LAB****B.Tech (EEE): 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 C-language.



**(A30314) ENGINEERING WORKSHOP**

(COMMON TO ALL BRANCHES)

**B.Tech (EEE): II 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- Turning on Lathe and other Operations on Lathe.,

**TEXT BOOK:**

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

**Course Outcomes:** By the end of the course the students will be able to

1. Create the different patterns with desired shape and size by using wood.
2. Align and assemble different components to create a product by fitting operations.
3. Fabricate the given material to desired product in a particular pattern by tin smithy.
4. Understand the basic principles of electrical systems in day-to-day applications.
5. Mould the component to desire pattern and shape by black smithy.
6. Create the object by casting process using molten metal.
7. Assemble the components with permanent joint by welding process.

8. Understand the process, transfer of fluid or gases from one place to another place by connecting set of pipes with different requirements in plumbing process

**(A30019) ENGINEERING EXPLORATION & PRACTICE****(Common to all branches)****B.Tech (EEE): II Semester****LTPC****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 solution, 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

## **References:**

1. Engineering Fundamentals: An Introduction to Engineering (MindTap Course List) 5th Edition by Saeed Moaveni
2. Software Project Management (SIE), (Fifth Edition); Bob Hughes, Mike Cotterell, 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 role of an Engineer as a problem solver.
2. Identify multi-disciplinary approach required in solving an engineering problem
3. Analyse a given problem using process of engineering problem analysis.
4. Build simple systems using engineering design process.
5. Analyse engineering solutions from sustainability perspectives.
6. Use basics of engineering project management skills in doing projects.
7. Demonstrate data acquisition and analysis skills using a tool.

**(A30006) NUMERICAL METHODS AND COMPLEX  
VARIABLES  
(Common to EEE, ECE)**

**B.Tech (EEE): 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, (36<sup>th</sup> 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(4<sup>th</sup> Edition), S.S. Sastry, PHI, 2005.
2. Complex Variables and Applications (7<sup>th</sup>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, (9<sup>th</sup>Edition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
5. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, LaxmiPublications, Reprint, 2008.
6. Higher Engineering Mathematics, (11<sup>th</sup> 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 (3<sup>rd</sup> 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 transforms.
2. Find the root of given equation and estimate unknown value using interpolation.
3. Find numerical solutions of ordinary differential equations.
4. Analyse 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.



**(A30201) NETWORK THEORY-I****B.Tech (EEE) III-Semester**

L	T	P	C
3	0	0	3

**Unit – I: Introduction to Electrical Circuits**

Circuit Concept, R-L-C parameters, Voltage and Current sources, Independent and dependent sources-Source transformation, Voltage, Current relationship for passive elements. Kirchoff's laws-network reduction techniques-Series, parallel, Series parallel, Star-to-Delta and Delta-to-Star transformation, Nodal analysis, Mesh Analysis, Super Node and Super Mesh for D.C.excitations.

**Unit – II: Single Phase A.C Circuits**

R.M.S and Average values and form factor for different periodic wave forms, Steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation – Concept of Reactance, Impedance, Susceptance and Admittance – Phase and Phase difference – Concept of power factor, Complex power, Real and Reactive powers – J-notation, Complex and Polar forms of representation.

**Unit – III: Locus diagrams, Resonance & Magnetic Circuits**

Locus diagrams – Series R-L, R-C and parallel combination with variation of various parameters – Resonance – Series, Parallel circuits, concept of band width and Q factor. Magnetic circuits-Faraday's laws of electromagnetic induction-concept of self and mutual inductance, Dot convention-Coefficient of coupling, Composite Magnetic Circuit-analysis of series and parallel magnetic circuits.

**Unit – IV: Network topology**

Definitions-Graph-Tree, Basic cutset and Basic Tieset matrices for planar networks-Loop and Nodal methods of analysis of Networks with dependent & independent voltage and current sources-Duality & Dual networks

**Unit – V: Network theorems (with DC & AC)**

Tellegen's, Superposition, Reciprocity, Thevenin's, Norton's. Maximum Power Transfer, Millman's and Compensation theorems for DC & AC excitations.

**Text Books**

1. Engineering Circuit Analysis – by William Hayt and Jack E. Kimmerly, Mc Graw Hill Company, 6th edition.
2. Electric Circuits by A.Chakrabarthy,Dhanipat Rai & Sons

**Reference Books**

1. Network Analysis by M.E.Van Valkenberg.
2. Linear Circuit Analysis (time domain phasor and Laplace transform approaches).Second edition by Raymond
3. Circuits & Networks by A.Sudhakar and Shyammohan S Palli,Tata McGraw-Hill
4. A.Decarlo and PEN-MIN-LIN.Oxford University Press.Second edition 2004.
5. Electrical Circuits Theory by K.Rajeswaran,Pearson Education 2004.
6. Basic Circuit Analysis by D.R.Cunningham & J.A.Stuller,Jaico Publications.

**Course Outcomes:**

On completion of the course, students will be able to

1. Reduce a electric network using source transformation, Kirchhoff's laws
2. Identify when & how to use network reduction & theorem with DC and AC excitations.
3. Explain the principle of AC fundamentals, series parallel circuits, locus diagram and resonance.
4. Explain basic principle of magnetic circuits & applications.
5. Analyze networks adopting network topology and concept of duality and dual networks.

**(A30202) ELECTROMAGNETIC FIELDS****B.Tech (EEE) III-Semester**

L	T	P	C
3	0	0	3

**Unit I: Review of Vector Calculus**

Vector algebra -addition, subtraction, components of vectors, scalar and vector multiplications, triple products, Three orthogonal coordinate systems (rectangular, cylindrical and spherical). Vector calculus differentiation, partial differentiation, integration, vector operator del, gradient, divergence and curl; integral theorems of vectors. Conversion of a vector from one coordinate system to another.

**Unit II : Static Electric Field**

Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Maxwell's first law,  $\text{div}(\mathbf{D}) = \rho_v$  Absolute Electric potential, potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.

**Unit III: Conductors, Dielectrics and Capacitance**

Current and current density, Ohms Law in Point form, Continuity of current, Boundary conditions of perfect dielectric materials. Permittivity of dielectric materials, Boundary Conditions between two dielectrics and between conductor and dielectric, Capacitance, Capacitance of a two wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation, Application of Laplace's and Poisson's equations.

**Unit IV: Static Magnetic Fields**

Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials. Steady magnetic fields produced by current carrying conductors. Maxwell's second Equation,  $\text{div}(\mathbf{B})=0$ .

**Ampere's circuital law and its applications** Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament – Point form of Ampere's circuital law – Maxwell's third equation,  $\text{Curl}(\mathbf{H})=\mathbf{J}_c$ , Field due to a circular loop, rectangular and square loops.

**Magnetic Forces, Materials and Inductance**

Force on a moving charge, Force on a differential current element, Force between differential current elements, Nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions, Magnetic circuits, inductances and mutual inductances.

### **Unit V: Time Varying Fields and Maxwell's Equations**

Faraday's law for Electromagnetic induction, Displacement current, Point form of equation, Integral form of Maxwell's equations, Motional Electromotive forces..

#### **Text Books:**

1. W. Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2012.
2. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.

#### **References:**

1. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009.
2. A. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.
3. G. W. Carter, "The electromagnetic field in its engineering aspects", Longmans, 1954.
4. W. J. Duffin, "Electricity and Magnetism", McGraw Hill Publication, 1980.
5. W. J. Duffin, "Advanced Electricity and Magnetism", McGraw Hill, 1968
6. E. G. Cullwick, "The Fundamentals of Electromagnetism", Cambridge University Press, 1966.
7. B. D. Popovic, "Introductory Engineering Electromagnetics", Addison-Wesley Educational Publishers, International Edition, 1971.

#### **Course Outcomes:**

On completion of the course, students will be able to

1. Explain the basic laws of electromagnetism.
2. Obtain the electric and magnetic fields for simple configurations under static conditions.
3. Analyze time varying electric and magnetic fields.
4. Express Maxwell's equations in different forms and different media.

**(A30401) ELECTRONIC DEVICES & CIRCUITS**

	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>B. Tech. (EEE) III-Semester</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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,  $\pi$ - 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  $\beta$ , 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. Distinguish the characteristics of BJT, FET and UJT.
3. Design and analyze the biasing circuitry of BJT and FET.
4. Analyze simple amplifier circuits using BJT and FET.

**(A30182)FLUID MECHANICS & HYDRAULIC MACHINERY**  
**B.Tech (EEE) III-Semester**

L	T	P	C
3	0	0	3

**Unit I**

**Fluid Statics:** Dimensions and Units, physical properties of fluids-specific gravity, viscosity, surface tension- Vapour pressure and their influence on fluid motion-Atmospheric, gauge and vacuum pressure-Measurement of pressure- Piezometer, U-Tube and Differential Manometers.

**Unit II**

**Fluid kinematics:** Stream line, path line and streak line and stream line, classification of flows steady & unsteady, uniform & non uniform, laminar & turbulent, rotational & irrotational flows-Equation of continuity for one dimensional flow and three dimensional flow.

**Fluid Dynamics:** Surface & body forces Euler's & Bernoulli's equations for flow along a stream line, moment equation and its applications on force on pipe bend. Measurement of flow: pitot tube, venturi meter and orifice meter, flow nozzle.

**Unit III**

**Closed Conduit Flow:** Reynold's experiment-Darcy Weisbach equation-Minor losses in pipes-Pipes in series and pipes in parallel-total energy line-hydraulic gradient line.

**Boundary Layer Concepts:** Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivations) boundary layer in transition, separation of boundary layers submerged objects-drag and lift .

**Unit IV**

**Basics and Hydraulic Turbine Turbo Machinery:** Hydro dynamic force on jets on stationary and moving plate, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency , flow over radial vanes. Classification of turbines, heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine, and Kaplan turbine-Working proportions, work done, efficiencies, hydraulic design-draft tube theory-functions and efficiency.

**Unit V**

**Performance of Hydraulic Turbines and Pumps:** Geometric similarity, unit and specific quantities, characteristic curves, governing

of turbines, selection of type of turbines, cavitation, surge tank, water hammer.

**Centrifugal Pumps:** Classification, working, work done-barometric head-Losses and efficiencies specific speed- Performance characteristic curves, NPSH.

**Reciprocating Pumps:** Working, discharge, slip, indicator diagrams.

### **Text Books**

1. 'Hydraulics, Fluid mechanics and hydraulic machinery' by MODI and SETH
2. Fluid mechanics and hydraulic machines by Rajput

### **Reference Books**

1. Fluid Mechanics and fluid power engineering by D.S.Kunar, Kotaria and sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New age international.
3. Hydraulic Machines by Banga and Sharma, Khanna publishers

### **Course Outcomes**

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

1. Explain the basic properties of fluids.
2. Analyze kinematics of fluids and dynamics of fluid flows.
3. Describe the boundary layer theory and impact of jets.
4. Compare different types of turbines and pumps.



**(A30203) ELECTRICAL MACHINES – I****B.Tech (EEE) III-Semester**

L	T	P	C
3	0	0	3

**Unit I: Electromagnetic force and torque**

B-H curve of magnetic materials; flux-linkage vs current characteristic of magnetic circuits; linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; force as a partial derivative of stored energy with respect to position of a moving element; torque as a partial derivative of stored energy with respect to angular position of a rotating element.

**Unit II: DC machines**

Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation – Elementary armature coil and commutator, lap and wave windings, Simplex and Multiplex windings, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.

**Unit III: DC machine - Motoring and Generation**

Armature circuit equation for motoring and generation, Types of field excitations - separately excited, shunt, series and compound. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. Load characteristics of DC generators. Torque-speed characteristics of DC motors. Speed control through armature voltage and field flux control. Principle of 3 point starter. Losses, load testing and back-to-back testing of DC machines.

**Unit IV: Single and Three Phase Transformers**

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test,

back-to-back test, separation of hysteresis and eddy current losses  
Three-phase transformer - construction, types of connection and their comparative features, Parallel operation of single-phase transformers.

### **Unit V: Auto Transformers and Tap Changers**

Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, Phase conversion - Scott connection, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers. Cooling of transformers.

#### **Text Books:**

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

#### **Reference books:**

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
4. B.L .Theraja and A.K.Theraja, "Electrical Technology", Volume –II, S.Chand Publishers

#### **Course Outcomes:**

At the end of this course, students will demonstrate the ability to

1. Explain concepts of magnetic circuits.
2. Describe operation of dc machines.
3. Analyse the differences in operation of different dc machine configurations.
4. Analyse the operation of single phase and three phase transformers
5. Explain auto transformer, phase conversions and tap changing.

**(A30404) ELECTRONIC DEVICES & CIRCUITS LAB**

(Common for ECE and EEE)

**B. Tech. (EEE) 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)**

1. Forward & Reverse Bias Characteristics of PN Junction diode characteristics.
2. Zener diode characteristics and Zener as Voltage regulator.
3. Input & Output characteristics of Transistor in CB configurations and h-parameter calculations.
4. Input & Output characteristics of Transistor in CE configurations 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): 0-20 $\mu$  A, 0-50  $\mu$ A, 0-100  $\mu$ A, 0-200  $\mu$ A, 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. Obtain characteristics of different diodes and design & analyze simple rectifier circuits through experimentation.
2. Obtain the characteristics of BJT, FET & UJT using appropriate experimental setup.
3. Design, implement and analyze the biasing circuitry of BJT and FET using appropriate experimental setup.
4. Design, implement and analyze different amplifier circuits using BJT and FET.

**(A30113) FLUID MECHANICS & HYDRAULIC MACHINERY  
LABORATORY**

**B.Tech (EEE) III-Semester**

**L T P C**

**0 0 3 1.5**

1. Calibration of Venturimeter & Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head method.
4. Calibration of contracted Rectangular Notch and /or Triangular Notch
5. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
6. Verification of Bernoulli's equation.
7. Impact of jet on vanes
8. Performance test on reciprocating pump
9. Performance test on single stage centrifugal pump
10. Performance test on multi stage centrifugal pump
11. 11.Performance and Specific speed test on Pelton wheel (or Turbo Wheel)
12. Performance and specific speed test on Francis Turbine
13. Performance and specific speed test on Kaplan Turbine

**Course Outcomes:** After completion of the experiments in this lab, the student shall be able to

1. Apply the knowledge in verification of fluid flow and estimate the friction and frictional loss in fluid flow.
2. Calibrate discharge measuring devices and finding discharge through the venture meter and the orifice meter
3. Calibrate discharge measuring devices for open channel or free flow like rectangular and triangular notch.
4. Calculate the coefficient of discharge for outlet devices viz small orifices and mouth pieces.
5. Determine performance characteristics of popular turbines and pumps.

**(A30016)GENDER SENSITIZATION****B.Tech (EEE) III-Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>

**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.

**OBJECTIVES OF THE COURSE**

- To develop students’ sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.

- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

### **Course Outcomes**

On Completion of the course, students will be able to

1. Learners identify realities of gender discrimination prevalent in the society at all levels.
2. Learners infer and discuss historical evidences, historical perspective and historical voices of discrimination against women in all societies and civilizations.
3. Learners recognize their bodies and value its health. Learners demonstrate their rights regarding their bodies.
4. Learners can identify, protest and overcome the evils of body shaming.
5. Learners analyze discrimination and exploitation of women labour in domestic as well as social sphere. Learners can infer women's rights, women's wage disparities, women's issues and demonstrate these grievances through law.
6. Learners 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.

**(A30204) POWER SYSTEMS-I**  
**B.Tech (EEE) IV-Semester**

L	T	P	C
3	0	0	3

**Unit-I: Conventional Energy Sources**

Evolution of Power Systems and Present-Day Scenario. Structure of a power system: Bulk

Power Grids and Micro-grids

**Thermal Power Stations:** Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gases.- Brief description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and Cooling towers.

**Hydro Electric Power station:** Elements of hydroelectric power station-types-concept of pumped storage plants-storage requirements, mass curve (explanation only) estimation of power developed from a given catchment area: head and efficiencies.

**Gas and Nuclear Power Stations** Nuclear Power Stations: Nuclear Fission and Chain reaction.- Nuclear fuels- Principle of operation of Nuclear reactor.-Reactor Components: Moderators, Control rods, Reflectors and Coolants.- Radiation hazards: Shielding and Safety precautions- Types of Nuclear reactors and brief description of PWR, BWR and FBR. Gas Power Stations: Principle of Operation and Components (Block Diagram Approach Only)

**Unit-II: Non Conventional Energy Sources**

Role and potential of new and renewable source, physics of the sun, Sources and potentials of Wind Energy

Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas

Resources of Geo thermal energy- types of wells, methods of harnessing the energy

**Unit-III: Distribution Systems**

**D.C. Distribution Systems:** Classification of Distribution Systems - Comparison of DC vs AC and Under-Ground vs Over-Head Distribution Systems- Requirements and Design features of Distribution Systems-Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed



at one end and at both the ends (equal/unequal Voltages) and Ring Main Distributor.

**A.C. Distribution Systems:** Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and referred to respective load voltages.

**Unit –IV: Substations, Power factor and Voltage Control Substations:**

Classification of substations: **Air insulated substations** - Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams.

**Gas insulated substations (GIS)** – Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, bus bar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

**Power factor and Voltage Control:** Causes of low p.f -Methods of Improving p.f -Phase advancing and generation of reactive kVAR using static Capacitors-Most economical p.f. for constant kW load and constant kVA type loads, Numerical Problems. Dependency of Voltage on Reactive Power flow.- Methods of Voltage Control: Shunt Capacitors, Series Capacitors, Synchronous Capacitors, Tap changing and Booster Transformers

**Unit-V: Economic Aspects of Power Generation** Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors- Numerical Problems.

**Tariff Methods:** Costs of Generation and their division into Fixed, Semi-fixed and Running Costs. Desirable Characteristics of a Tariff Method.-Tariff Methods: Flat Rate, Block-Rate, two-part, three –part, and power factor tariff methods and Numerical Problems

**Text Books**

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. Electrical Power Systems by C.L.Wadhawa, New Age International (P) Limited, Publishers 1997.

### **Reference Books**

1. Elements of Power Station design and practice by M.V. Deshpande, Wheeler Publishing.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
3. Gas turbine performance, by PP Wals, P.Fletcher, Blackwell Publisher, 2004.
4. Principles of Power Systems by V.K Mehta and Rohit Mehta S.Chand & Company Ltd., New Delhi 2004.
5. Non-Conventional Energy Sources /G.D. Rai

### **Course Outcomes**

On completion of the course, students will be able to

1. Illustrate different types of conventional power plants
2. Illustrate different types of non-conventional energy sources
3. Classify DC and AC distribution systems.
4. Categorize and discriminate different types of substations and methods to improve the power factor
5. Appraise the economic aspects of power generation

**(A30205) ELECTRICAL MACHINES – II**  
**B.Tech (EEE) IV-Semester**

L	T	P	C
3	0	0	3

**Unit I : Fundamentals of AC machine windings**

Physical arrangement of windings in stator and cylindrical rotor; slots for windings; single turn coil; full-pitch and short pitch coils, concentrated winding, distributed winding, 3D visualization of the above winding types, Air-gap MMF distribution with fixed current through winding - concentrated and distributed winding, distribution and coil span factor

**Unit II: Pulsating and revolving magnetic fields**

Constant magnetic field, pulsating magnetic field - alternating current in windings with spatial displacement, Magnetic field produced by a single winding due to alternating current . Pulsating fields produced by spatially displaced windings, Windings spatially shifted by 90 degrees, Addition of pulsating magnetic fields, Three windings spatially shifted by 120 degrees (carrying three-phase balanced currents), revolving magnetic field.

**Unit III:3- $\phi$  Induction Machines**

Construction, Types (squirrel cage and slip-ring), Torque Slip Characteristics, Starting and Maximum Torque. Equivalent circuit. Phasor Diagram, Losses and Efficiency. Effect of parameter variation on torque speed characteristics (variation of rotor and stator resistances, stator voltage, frequency). Circle Diagram-No load & Blocked Rotor tests- predetermination of performance, Methods of starting and speed control for induction motors. Generator operation. Self-excitation. Doubly-Fed Induction Machines.

**Unit IV: Single-  $\phi$  induction motors and Special Machines**

Constructional features, double revolving field theory, equivalent circuit, determination of parameters. Split-phase starting methods and applications.

Introduction to Special Machines- AC series motors, Universal motor, Stepper motor

**Unit V: Synchronous machines**

Constructional features, cylindrical rotor synchronous machine - generated EMF, equivalent circuit and phasor diagram, armature

reaction, synchronous impedance, voltage regulation. Operating characteristics of synchronous machines, V-curves. Salient pole machine – two reaction theory, analysis of phasor diagram, power angle characteristics. Hunting and its Suppression, Methods of Starting, Parallel operation of alternators - synchronization and load division.

**Text Books:**

1. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
2. I. J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.

**Reference Books:**

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers, 2004.
3. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.
4. A. S. Langsdorf, “Alternating current machines”, McGraw Hill Education, 1984.
5. B.L .Theraja and A.K.Theraja, “Electrical Technology”, Volume –II, S.Chand Publishers

**Course Outcomes:**

By the end of the course students will be able to

1. Understand different types of Armature windings and its connections
2. Describe the production of rotating magnetic field from alternating fields
3. Describe operation of poly phase Induction Machine and its performance characteristics of Induction Motor
4. Illustrate the operation of different types of single phase induction motor and special motors
5. Explain constructional features, types, operation of synchronous machines

**(A30206) NETWORK THEORY-II****B.Tech (EEE) IV-Semester**

L	T	P	C
3	0	0	3

**Unit- I: Three Phase Circuits** Three phase circuits: Phase sequence-Star and delta connection-Relation between line and phase voltages and currents in balanced systems-Analysis of balanced and unbalanced 3 phase circuits Measurement of active and reactive power.

**Unit-II: D.C & AC Transient Analysis:** Transient response of R-L,R-C,R-L-C circuits (Series and parallel combination) for D.C & AC excitation-Initial conditions-solution method using differential equation and Laplace transforms.

**Unit-III: Network Functions** The concept of Complex Frequency, physical Interpretation of Complex Frequency, Transform Impedance and Transform Circuits, Series and parallel Combination of Elements, Terminal Pairs or Ports, Networks Functions for One-port and Two-port Network Poles and Zeros of Network Functions, Significance of poles and Zeros, Properties of Driving Point Functions, Properties of Transfer Functions, Necessary Conditions for Driving Point Functions, Necessary Conditions for Transfer Functions, Time Domain Response from Pole Zero Plot

**Unit-IV: Network Parameters & Filters** Two port network parameters  $-Z$ ,  $Y$ , ABCD and hybrid parameters and their relations Cascaded networks, concept of transformed network-2port network parameters using transformed variables. **Filters** Low pass, High pass, Band pass, Band elimination, prototype filter design

**Unit-V: Fourier analysis of A.C Circuits** The Fourier theorem, consideration of symmetry, exponential form of Fourier series, line spectra and phase angle spectra, Fourier integrals and Fourier transforms, properties of Fourier transforms.

**Text Books :**

1. Electric Circuits by A.Chakrabarthy, Dhanpat Rai & Sons
2. Circuits & Networks by A.Sudhakar and Shyammoan S Palli,Tata McGraw-Hill

**Reference Books :**

1. Network Analysis by M.E.Van Valkenberg
2. Electric circuit Analysis by C.L.Wadhwa, New Age international
3. Electric circuits by David A.Bell, Oxford University press
4. Basic circuit analysis by D.R.Cunningham & J.A.Stuller, Jaico Publications.
5. Electric Circuit theory by K.Rajeswaran, Pearson Education 2004.
6. Electric circuit analysis by B.Subrahmanyam, I.K.international

**Course Outcomes:** Upon the completion of the course the students will be able to

1. Analyze and categorize three phase circuits.
2. Perform transient analysis on basic electrical circuits with AC and DC excitations.
3. Demonstrate network functions with the concept of Complex Frequency.
4. Compute two port network parameters, assess various types of filters.
5. Apply Fourier transforms to analyze AC circuits.

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

**B. Tech. (EEE) 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.

**(A30403) SWITCHING THEORY & LOGIC DESIGN**

<b>B. Tech. (EEE) III-Semester</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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**

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, comparison 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, 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 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 Graph Methods 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 - Zvi Kohavi, & 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, 3<sup>rd</sup> Edition, 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 simplify the Boolean Functions.
- 3 Design simple Combinational Circuits.
- 4 Design simple Sequential Circuits.
- 5 Distinguish the Finite State Machines and Algorithmic State Machines Charts.

**(A30207) ELECTRICAL MACHINES – ILAB****B.Tech (EEE) IV-Semester****L T P C****0 0 3 1.5****Compulsory Experiments:**

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Load test on DC series generator. Determination of characteristics.
4. Load test on DC compound generator. Determination of characteristics.
5. Hopkinson's test on DC shunt machines. Predetermination of efficiency.
6. Fields test on DC series machines. Determination of efficiency.
7. Swinburne's test and speed control of DC shunt motor. Predetermination of efficiencies.
8. Brake test on DC compound motor. Determination of performance curves.

**In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted:**

1. Brake test on DC shunt motor. Determination of performance curves.
2. Retardation test on DC shunt motor. Determination of losses at rated speed.
3. Separation of losses in DC shunts motor.

**Course Outcomes** On completion of the course, students will be able to

Obtain the process of emf induced in DC generator.

1. Analyze the characteristics of different types of DC generators by performing load test.
2. Analysis performance of DC machines by indirect tests.
3. Determine the performance curves of DC motors by brake tests.

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**(A30208) ELECTRICAL NETWORKS LAB****B.Tech (EEE) IV-Semester****L T P C****0 0 3 1.5****PART-A: Electrical Circuits**

1. Verification of Thevenin's, and Norton's Theorems
2. Verification of Superposition and Maximum Power Transfer Theorems
3. Verification of RMS value of complex wave
4. Verification of Compensation Theorem
5. Verification of Reciprocity, Millmann's Theorems
6. To draw the Locus Diagrams of RL and RC Series Circuits
7. Determine the frequency by Series and Parallel Resonance
8. Determination of Self, Mutual Inductances and Coefficient of coupling
9. Determination of Z and Y Parameters
10. Determination of Transmission and hybrid parameters
11. Measurement of Active Power for Star and Delta connected balanced loads
12. Measurement of Reactive Power of Star and Delta connected balanced loads
13. Measurement of 3-phase Power by two Wattmeter Method for unbalanced loads

**PART-B: PSPICE Simulation**

1. Simulation of DC Circuits
2. DC Transient response
3. Mesh Analysis
4. Nodal Analysis

NOTE: **Eight** experiments are to be conducted from PART-A and all experiments from PART-B

**Course Outcomes:**

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

1. Determine the Thevenin's voltage & resistance of a circuit, able to determine the Norton's current and resistance of a circuit.
2. Solve a multi source network using super position theorem.
3. Determine Z, Y and H, ABCD Parameters of a circuit.

4. Determine active power and reactive power for various loads.
5. Solve any complex circuit using Simulation(PSPICE)
6. Determine load resistance in a circuit to transfer maximum power using maximum power transfer theorem.

**(A30021)SOCIAL INNOVATION IN PRACTICE****(Common for all branches)****B.Tech (EEE) IV-Semester****LTPC****0 0 2 1****UNIT 1**

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

**UNIT 2**

Social Innovation – Case Studies

Presentation of the case studies with a focus on impact and vision on society.

**UNIT 3**

Process of Social Innovation

Prompts – identifying needs, Proposals – generating ideas, Prototyping – testing the idea in practice,

**UNIT 4**

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

Systematic change.

**UNIT 5**

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, Yeheskel Hasenfeld; Palgrave Macmillan
3. Social Enterprise Law: Trust, Public Benefit and Capital Markets By Dana Brakman Reiser & Steven A. Dean

**Outcomes:**

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

1. Summing up several social issues to be addressed
2. Analyze the feasibility and economical factors
3. Develop a scalable business model.



**(A30015) SOFT SKILLS & PROFESSIONAL ETHICS****B.Tech (EEE) IV-Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>

**UNIT-I:****Business Communication Skills:**

English Language Enhancement the Art of Communication.

**OBJECTIVE**

- The student will gain a functional understanding of basic English Grammar
- Practice language skills to eliminate errors in pronunciation and sentence construction
- Understand and enhance interpersonal communication process

**UNIT-II:****Intrapersonal & Interpersonal Relationship Skills:**

- Intrapersonal Relationships
- Interpersonal Relationships – To be an Effective Team Player

**OBJECTIVE**

- The student will understand the importance of and the various skills involved in developing enriching interpersonal relationships
- Be more aware of his/her own self – confidence, values
- Understand and handle emotions of self and others.
- Understand the necessity and importance of working together as a team
- Learn how to go about being a good team player and form an effective team
- Have put their team building skills to test in the various activities to understand where they stand and improve themselves with each succeeding activity.

**UNIT-III:****Campus to Company:**

- Corporate Dressing
- Corporate Grooming
- Business Etiquette
- Communication Media Etiquette

**OBJECTIVE**

- The student will understand what constitutes proper grooming and etiquette in a professional environment.
- Have some practical tips to handle him/her in a given professional setting.
- Have practiced the skills necessary to demonstrate a comfort level in executing the same.

**UNIT-IV:**

**Group Discussions, Interviews and Presentations:**

- Group Discussions
- Interviews
- Presentations

**OBJECTIVE**

- The student will be able to appreciate the nuances of the Group Decision-making process.
- Understand the skills tested and participate effectively in Group Discussions.
- Learn the basics of how to make an effective presentation and have numerous practice presentations in small groups and larger audiences.
- Attend any type of interview with the confidence borne out of knowledge gained and practice sessions.

**UNIT-V:**

**Entrepreneurial Skills Development:**

- Goal Setting
- Entrepreneurial Skills – Awareness and Development

**OBJECTIVE**

- The student will be able to set specific measurable goals for themselves in their personal and/or professional life.

- Understand the skills and the intricacies involved in starting an entrepreneurial venture.

## **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. Recognise and identify basic English grammar

**(A30209)CONTROL SYSTEMS****B.Tech EEE V Sem****L T P C  
3 0 0 3****Course objectives:**

1. To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
2. To assess the system performance using time domain analysis and methods for improving it
3. To assess the system performance using frequency domain analysis and techniques for improving the performance
4. To design various controllers and compensators to improve system performance

**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.

**Transfer Function Representation:** Transfer Function of DC Servo motor - AC Servomotor- Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples - Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

**UNIT-II: 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.

**UNIT – III: STABILITY ANALYSIS**

The concept of stability - Routh stability criterion – qualitative stability and conditional 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.

**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.

#### **UNIT - IV: STABILITY ANALYSIS IN FREQUENCY DOMAIN:**

Polar Plots, Nyquist Plots and applications of Nyquist criterion to find the stability - Effects of adding poles and zeros to  $G(s)H(s)$  on the shape of the Nyquist diagrams.

**Classical Control Design Techniques:** Compensation techniques – Lag, Lead, and Lead-Lag Controllers design in frequency Domain, PID Controllers.

#### **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 its Properties. Concept of controllability and observability

#### **TEXT BOOKS:**

1. “I. J. Nagrath and M. Gopal”, “Control Systems Engineering”, New Age International (P) Limited, Publishers, 5th edition, 2009
2. “B. C. Kuo”, “Automatic Control Systems”, John Wiley and Sons, 8th edition, 2003.

#### **REFERENCE BOOKS:**

1. “N. K. Sinha”, “Control Systems”, New Age International (P) Limited Publishers, 3<sup>rd</sup> Edition, 1998.
2. “NISE”, “Control Systems Engineering”, John Wiley, 6th Edition, 2011.
3. “Katsuhiko Ogata”, “Modern Control Engineering”, Prentice Hall of India Pvt. Ltd., 3<sup>rd</sup> edition, 1998.

**Course outcomes:** After completion of this course the student is able to

1. Choose a suitable controller and/or a compensator for a specific application to improve the system performance

2. Apply various time domain and frequency domain techniques to assess the system performance
3. Apply various control strategies to different applications (example: Power systems, electrical drives etc...)
4. Test system Controllability and Observability using state space representation and applications of state space representation to various systems.

**(A30210)POWER ELECTRONICS****B.Tech EEE V Sem****L T P C  
3 0 0 3****Course Outcomes:**

At the end of this course students will demonstrate the ability to

- To Design/develop suitable power converter for efficient control or conversion of power in drive applications.
- To Design / develop suitable power converter for efficient transmission and utilization of power in power system applications.

**UNIT-I: POWER SWITCHING DEVICES**

Concept of power electronics, scope and applications, types of power converters; Power semiconductor switches and their V-I characteristics - Power Diodes, Power BJT, SCR, Power MOSFET, Power IGBT; Thyristor ratings and protection, methods of SCR commutation, UJT as a trigger source, gate drive circuits for BJT and MOSFETs

**UNIT-II: AC-DC CONVERTERS (PHASE CONTROLLED RECTIFIERS)**

Principles of single-phase fully-controlled converter with R, RL, and RLE load, Principles of single-phase half-controlled converter with RL and RLE load, Principles of three-phase fully-controlled converter operation with RLE load, Effect of load and source inductances, General idea of gating circuits, Single phase and Three phase dual converters

**UNIT-III: DC-DC CONVERTERS (CHOPPER)**

Introduction, elementary chopper with an active switch and diode, concepts of duty ratio, average inductor voltage, average capacitor current. Buck converter - Power circuit, analysis and waveforms at steady state, duty ratio control of output voltage. Boost converter - Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage. Buck-Boost converter – Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

**UNIT-IV: AC-DC CONVERTERS (INVERTERS)**

Introduction, principle of operation, performance parameters, single phase bridge inverters with R, RL loads, 3-phase bridge inverters - 120 and 180 degrees mode of operation, Voltage control of single

phaseinverters –single pulse width modulation, multiple pulse width modulation, sinusoidal pulse width

### **UNIT-V: AC-AC CONVERTERS**

Phase Controller (AC Voltage Regulator)-Introduction, principle of operation of single phasevoltagecontrollers for R, R-L loads and its applications. Cyclo-converter-Principle of operation of single phasecyclo-converters, relevant waveforms, circulating current mode of operation, Advantages anddisadvantages.

#### **TEXT BOOKS:**

1. Power Electronics – by M. D. Singh & K. B. Kanchandhani, Tata Mc Graw – Hill Publishing company,1998.
2. Power Electronics – by Vedam Subramanyam, New Age International (P) Limited, Publishers
3. P.S.Bhimbra. Power Electronics’,Khanna publications

#### **REFERENCES:**

1. R. W. Erickson and D. Maksimovic, “Fundamentals of Power Electronics”, Springer Science &Business Media, 2007.
2. L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.
3. Power Electronics Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998
4. Power Electronics - by V.R.Murthy , 1st edition -2005, OXFORD University Press
5. Power Electronics-by P.C.Sen, Tata Mc Graw-Hill Publishing.
6. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradra, A. Joshi and R. M. K. Sinha,
7. New Age International (P) Limited Publishers, 1996.

**Course Outcomes:** By the end of this course students will be able to

1. Explain the operation and performance characteristics of various semiconductor devices.
2. Design and analyze various rectifier circuits.
3. Modulate AC voltage & frequency for various load applications.
4. Illustrate different types of choppers
5. Design and analyze various inverter circuits



**(A30211)POWER SYSTEMS-II****B.Tech EEE V Sem****L T P C  
3 0 0 3****Course Objectives:**

- To compute inductance and capacitance of different transmission lines.
- To understand performance of short, medium and long transmission lines.
- To examine the traveling wave performance and sag of transmission lines.
- To design insulators for overhead lines and understand cables for power transmission.

**UNIT I: TRANSMISSION LINE PARAMETERS**

Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems.

Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

**UNIT II: PERFORMANCE OF SHORT AND MEDIUM LENGTH TRANSMISSION LINES**

Classification of Transmission Lines - Short, medium and long line and their model representations -- Nominal-T, Nominal-Pi and A, B, C, D Constants for symmetrical & Asymmetrical Networks, Numerical Problems. Mathematical Solutions to estimate regulation and efficiency of all types of lines - Numerical Problems.

**PERFORMANCE OF LONG TRANSMISSION LINES:** Long Transmission Line - Rigorous Solution, evaluation of A, B, C, D Constants, Interpretation of the Long Line Equations, Incident, Reflected and Refracted Waves - Surge Impedance and SIL of Long Lines, Wave Length and Velocity of Propagation of Waves - Representation of Long Lines - Equivalent-T and Equivalent Pi network models (numerical problems).

**UNIT III: POWER SYSTEM TRANSIENTS**

Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of lines with different types of conditions - Open Circuited Line, Short Circuited Line, T Junction, lumped Reactive Junctions (Numerical Problems), (for all the cases mentioned with numerical examples).

**VARIOUS FACTORS GOVERNING THE PERFORMANCE OF TRANSMISSION LINE:**

Skin and Proximity effects - Description and effect on Resistance of Solid Conductors - Ferranti effect - Charging Current - Effect on Regulation of the Transmission Line. Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.

**UNIT-IV: OVERHEAD LINE INSULATORS**

Types of Insulators, String efficiency and Methods for improvement, Numerical Problems - voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding.

**SAG AND TENSION CALCULATIONS:** Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems - Stringing chart and sag template and its applications.

**UNIT-V: UNDERGROUND CABLES:** Types of Cables, Construction, Types of Insulating materials, Calculation of Insulation resistance and stress in insulation, Numerical Problems. Capacitance of Single and 3-Core belted cables, Numerical Problems. Grading of Cables - Capacitance grading - Numerical Problems, Description of Inter-sheath grading - HV cables.

**TEXT BOOKS:**

1. "C. L. Wadhwa", "Electrical power systems", New Age International (P) Limited Publishers, 1998.
2. "Grainger and Stevenson", "Power Systems Analysis", Mc Graw Hill, 1st Edition 2003.
3. "M. L. Soni, P. V. Gupta, U.S. Bhatnagar and A. Chakrabarty", Power System Engineering, Dhanpat Rai & Co Pvt. Ltd, 2009.

**REFERENCE BOOKS:**

1. “I. J. Nagarath& D. P Kothari”, “Power System Engineering”, TMH, 2nd Edition2010
2. “B. R. Gupta”, “Power System Analysis and Design”, Wheeler Publishing, 1998.
3. “Abhijit Chakrabarti and SunithaHalder”, “Power System Analysis Operation andcontrol”, PHI, 3rd Edition, 2010

**Course Outcomes:** After completion of this course, the student

1. Illustrate the computation of inductance and capacitance for different configurations of transmission lines.
2. Analyze the performance of transmission lines
3. Explain the transient’s phenomenon of transmission lines.
4. Examine the sag and tension calculations.
5. Develop overhead line insulators and underground cables.

**(A30212)POWER SYSTEM PROTECTION****B.Tech EEE V Sem****L T P C  
2 1 0 3****Course Objectives:**

- To introduce all kinds of circuit breakers and relays for protection of Generators,
- Transformers and feeder bus bars from Over voltages and other hazards.
- To describe neutral grounding for overall protection.
- To understand the phenomenon of Over Voltages and its classification.

**UNIT - I : INTRODUCTION TO CIRCUIT BREAKERS**

Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages.- Restriking Phenomenon, Average and Maximum RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB ratings and Specifications: Types and Numerical Problems. – Autoreclosures. Description and Operation of following types of circuit breakers: Minimum Oil Circuitbreakers, Air Blast Circuit Breakers, Vacuum, and SF6 circuit breakers.

**UNIT – II: ELECTROMAGNETIC AND STATIC RELAYS**

Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays. Types of Over Current Relays: Instantaneous, DMT and IDMT types. Application of relays: Over current/ under voltage relays, Direction relays, Differential Relays and Percentage Differential Relays. Universal torque equation, Distance relays: Impedance, Reactance, and Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison. Static Relays: Static Relays versus Electromagnetic Relays. microprocessor based protective relays.

**MICROPROCESSOR BASED RELAYS:** Advantages, over current relays, directional relays, distance relays

**UNIT – III: OF POWER EQUIPMENT**

Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on % Winding Unprotected. Protection of transformers: Percentage Differential Protection, Numerical Problem

on Design of CT's Ratio, Buchholtz relay Protection. Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay.

Protection of Bus bars – Differential protection.

### **PILOT RELAYING SCHEMES**

Wire Pilot protection, Carrier current protection.

### **UNIT – IV: NEUTRAL GROUNDING**

Grounded and Ungrounded Neutral Systems. - Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance- Arcing Grounds and Grounding Practices.

### **UNIT - V: PROTECTION AGAINST OVER VOLTAGES**

Generation of Over Voltages in Power Systems.-Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters -Insulation Coordination -BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.

### **TEXT BOOKS:**

1. “Badri Ram , D. N Viswakarma”, “Power System Protection and Switchgear”, TMH Publications, 2011
2. “Sunil S Rao”, “Switchgear and Protection”, Khanna Publishers, 2008.
3. U.A.Bakshi, M.V.Bakshi: Switchgear and Protection, Technical Publications, 2009.

### **REFERENCE BOOKS:**

1. “Paithankar and S. R. Bhide”, “Fundamentals of Power System Protection”, PHI, 2003.
2. “C R Mason”, Art & Science of Protective Relaying – Wiley Eastern Ltd, 1966.
3. “C. L. Wadhwa”, “Electrical Power Systems”, New Age international (P) Limited, Publishers, 6th Edition 2007.
4. C.Russel Mason – “The art and science of protective relaying, Wiley Eastern, 1995
5. L.P.Singh “Protective relaying from Electromechanical to Microprocessors”, New Age International

**Course Outcomes:** After Completion of this course student will be able to

1. Explain the types of Circuit breakers and choice of Relays for appropriate protection of power system equipment.
2. Demonstrate various types of Protective devices in Electrical Power Systems.
3. Interpret the existing transmission voltage levels and various means to protect the system against over voltages.
4. Illustrate the importance of Neutral Grounding, Effects of Ungrounded Neutral grounding on system performance, Methods and Practices.
5. Explain the basic principles of digital protection.

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**(A30213)ELECTRICAL MEASUREMENTS****B.Tech EEE V Sem****L T P C  
3 0 0 3****Course Objective**

This course introduces the basic principles of all measuring instruments. It also deals with the measurement of RLC parameters voltage, current Power factor, power, energy and magnetic measurements and to understand the basic concepts of smart and digital metering.

**UNIT I: POTENTIOMETERS**

Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate type's standardization –applications

**UNIT II: RESISTANCE MEASUREMENTS**

Method of measuring low, medium and high resistance – sensitivity of Wheatstone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method.

**UNIT III: DC & AC BRIDGES**

Method of measuring low, medium and high resistance – sensitivity of Wheat-stone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance –loss of charge method. Measurement of inductance- Maxwell's bridge, Hay's bridge, Anderson's bridge - Owen's bridge. Measurement of capacitance and loss angle –Desauty's Bridge - Wien's bridge – Schering Bridge.

**UNIT IV: MAGNETIC MEASUREMENTS**

Ballistic galvanometer – equation of motion – flux meter – constructional details, comparison with ballistic galvanometer. Determination of B-H Loop methods of reversals six point method –

A.C. testing – Iron loss of bar samples– core loss measurements by bridges and potentiometers.

**UNIT V: INTRODUCTION TO SMART AND DIGITAL METERING:** Digital Multi-meter, True RMS meters, Clamp-on meters, Digital Storage Oscilloscope.

**TEXT BOOKS:**

1. “A. K. Sawhney”, “Electrical & Electronic Measurement & Instruments”, Dhanpat Rai & Co.Publications, 2005.
2. “E.W. Golding and F. C. Widdis”, “Electrical Measurements and measuring Instruments”, Fifth Edition, Wheeler Publishing, 2011.

**REFERENCE BOOKS:**

1. “S. C. Bhargava”, “Electrical Measuring Instruments and Measurements”, BS Publications, 2012.
2. “R. K. Rajput”, “Electrical & Electronic Measurement & Instrumentation”, S. Chand and Company Ltd., 2007.
3. “Buckingham and Price”, “Electrical Measurements”, Prentice – Hall, 1988.
4. “Reissland, M. U”, “Electrical Measurements: Fundamentals, Concepts, Applications”, New Age International (P) Limited Publishers, 1st Edition 2010.
5. “G. K. Banerjee”, “Electrical and Electronic Measurements”, PHI Learning Pvt. Ltd., 2nd Edition, 2016

**Course Outcomes:** After completion of this course, the student will be able to

1. Compare different types of measuring instruments, their construction, operation and characteristics
2. Identify the instruments suitable for typical measurements
3. Apply the knowledge about magnetic measuring and to use them effectively.
4. Apply the knowledge of smart and digital metering for industrial applications



**(A30247)OPTIMIZATION TECHNIQUES  
PROFESSIONAL ELECTIVE-I**

**B.Tech EEE V Sem****L T P C  
3 0 0 3****Course Objectives:**

- To introduce various optimization techniques i.e classical, linear programming, transportation problem, simplex algorithm, dynamic programming
- Constrained and unconstrained optimization techniques for solving and optimizing an electrical and electronic engineering circuits design problems in real world situations.
- To explain the concept of Dynamic programming and its applications to project implementation.

**UNIT-I: INTRODUCTION AND CLASSICAL OPTIMIZATION TECHNIQUES**

Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.

**CLASSICAL OPTIMIZATION TECHNIQUES:** Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints –Kuhn – Tucker conditions.

**UNIT-II: LINEAR PROGRAMMING**

Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

**TRANSPORTATION PROBLEM:**Finding initial basic feasible solution by north – west corner rule,least cost method and Vogel's

approximation method – testing for optimality of balanced transportation problems.

### **UNIT-III: UNCONSTRAINED NONLINEAR PROGRAMMING**

One dimensional minimization methods, Classification, Fibonacci method and Quadratic interpolation method

**UNCONSTRAINED OPTIMIZATION TECHNIQUES:** Uni-variant method, Powell’s method and steepest descent method.

### **UNIT-IV: CONSTRAINED NONLINEAR PROGRAMMING**

Characteristics of a constrained problem - classification - Basic approach of Penalty Function method

Basic approach of Penalty Function method - Basic approaches of Interior and Exterior penalty function methods - Introduction to convex programming problem.

### **UNIT-V: DYNAMIC PROGRAMMING**

Dynamic programming multistage decision processes – types – concept of sub optimization and the

principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

### **TEXT BOOKS:**

1. Singiresu S. Rao, Engineering Optimization: Theory and Practice by John Wiley and Sons, 4th
2. edition, 2009.
3. H. S. Kasene & K. D. Kumar, Introductory Operations Research, Springer (India), Pvt. Ltd., 2004

### **REFERENCES:**

1. George Bernard Dantzig, Mukund Narain Thapa, “Linear programming”, Springer series in operations research 3rd edition, 2003.
2. H.A. Taha, “Operations Research: An Introduction”, 8th Edition, Pearson/Prentice Hall, 2007.
3. Kalyanmoy Deb, “Optimization for Engineering

**Course Outcomes:** After completion of this course, the student will be able to

1. Explain the need of optimization of engineering systems
2. Understand optimization of electrical and electronics engineering problems
3. Apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
4. Apply unconstrained optimization and constrained non-linear programming and dynamic programming
5. Formulate optimization problems.

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**(A30232)ELECTRICAL INSTRUMENTS**  
(Professional Elective-1)

**B.Tech EEE V Sem**

**L T P C**  
**3 0 0 3**

**Course Objectives:**

- To introduce the basic principles of all measuring instruments
- To deal with the measurement of voltage, current, Power factor, power, energy and magnetic measurements.

**UNIT I: INTRODUCTION TO MEASURING INSTRUMENTS**

Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters electrometer type and attracted disc type – extension of range of E.S. Voltmeters.

**UNIT II: INSTRUMENT TRANSFORMERS**

CT and PT – Ratio and phase angle errors – design considerations  
Type of P.F. Meters – dynamometer and moving iron type – 1-ph and 3-ph meters – Frequency meters – resonance type and Weston type – synchro scopes.

**UNIT III: MEASUREMENT OF POWER**

Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems.

**UNIT IV: MEASUREMENT OF ENERGY**

Single phase induction type energy meter – driving and braking torques – errors and compensations – testing by phantom loading using R.S.S. meter. Three phase energy meter – trivector meter, maximum demand meters.

**UNIT-V: TRANSDUCERS**

Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, gauge factor, Thermistors, Thermo couples, Piezo electric transducers, photovoltaic, photo conductive cells, and photo diodes.

**TEXT BOOKS:**

1. “A. K. Sawhney”, “Electrical & Electronic Measurement & Instruments”, Dhanpat Rai & Co.Publications, 2005.
2. “E.W. Golding and F. C. Widdis”, “Electrical Measurements and measuring Instruments”, Fifth Edition, Wheeler Publishing, 2011.

**REFERENCES BOOKS:**

1. “S. C. Bhargava”, “Electrical Measuring Instruments and Measurements”, BS Publications, 2012.
2. “R. K. Rajput”, “Electrical & Electronic Measurement & Instrumentation”, S. Chand and Company Ltd., 2007.
3. “Buckingham and Price”, “Electrical Measurements”, Prentice – Hall, 1988.
4. “Reissland, M. U”, “Electrical Measurements: Fundamentals, Concepts, Applications”, New Age International (P) Limited Publishers, 1st Edition 2010.
6. “G. K. Banerjee”, “Electrical and Electronic Measurements”, PHI Learning Pvt. Ltd., 2nd Edition, 2016

**Course Outcomes:** After completion of this course, the student able to

1. Understand different types of measuring instruments, their construction, operation and
2. characteristics
3. Identify the instruments suitable for typical measurements
4. Apply the knowledge about transducers and instrument transformers to use them effectively.

**(A30233)ELECTRIC SMART GRID TECHNOLOGIES  
(Professional Elective-1)**

**B.Tech EEE V Sem**

**L T P C  
3 0 0 3**

**UNIT-1: INTRODUCTION TO SMART GRID:** What is Smart Grid? Working definitions of Smart Grid and Associated Concepts – Smart Grid Functions – Traditional Power Grid and Smart Grid – New Technologies for Smart Grid – Advantages – Indian Smart Grid – Key Challenges for Smart Grid.

**UNIT-II: SMART GRID ARCHITECTURE:** Components and Architecture of Smart Grid Design – Review of the proposed architectures for Smart Grid. The fundamental components of Smart Grid designs – Transmission Automation – Distribution Automation – Renewable Integration

**UNIT-III: DISTRIBUTION GENERATION TECHNOLOGIES:** Storage Technologies, Energy storage requirements, Battery parameters Batteries and their types ultra-capacitor, fly wheel mechanism , Fuel Cell basic principle and operation, Types of Fuel Cells, PEMFC and its operation, Modelling of PEMFC, Super Capacitors– Electric Vehicles and plug – in hybrids – Environmental impact and Climate Change – Economic Issues

**UNIT IV: PERFORMANCE ANALYSIS TOOLS FOR SMART GRID DESIGN:** Introduction to Load Flow Studies, Challenges to Load Flow in Smart Grid and Weaknesses of the Present Load Flow Methods, Load Flow State of the Art: Classical, Extended Formulations, and Algorithms, Congestion Management Effect, Load Flow for Smart Grid Design, DSOPF Application to the Smart Grid

**UNIT V: COMMUNICATION TECHNOLOGIES AND SMART GRID:** Introduction to Communication Technology – Synchro Phasor Measurement Units (PMUs) – Wide Area Measurement Systems (WAMS).

**Control of Smart Power Grid System:** Load Frequency Control (LFC) in Micro Grid System – Voltage Control in Micro Grid System

– Reactive Power Control in Smart Grid. Case Studies and Test beds for the Smart Grids.

**TEXT BOOKS:**

1. Clark W. Gellings, “The Smart Grid: Enabling Energy Efficiency and Demand Response”, CRC Press.
2. JanakaEkanayake, N. Jenkins, K. Liyanage, J. Wu, Akihiko Yokoyama, “Smart Grid: Technology and Applications”, Wiley.

**REFERENCE BOOKS**

1. Ali K., M.N. Marwali, Min Dai, “Integration of Green and Renewable Energy in Electric Power Systems”, Wiley.
2. Jean Claude Sabonnadiere, NouredineHadjsaid, “Smart Grids”, Wiley Blackwell.
3. Tony Flick and Justin Morehouse, “Securing the Smart Grid”, Elsevier Inc.
4. Peter S. Fox-Penner, “Smart Power: Climate Change, the Smart Grid, and the Future of Electric Utilities”, Island Press.
5. James Momoh “SMART GRID Fundamentals of Design and Analysis”, IEEE press, A John Wiley & Sons, Inc., Publication.
6. Bhavesh Bhalja, R. P. Maheshwari and N. G. Chothani, "Protection and Switchgear", Oxford University Press, New Delhi, India, 2nd Edition, 2015

**Course Outcomes:**

1. Illustrate the structure of an electricity market.
2. Demonstrate the advantages of DC distribution and developing technologies.
3. Contrast the trade-off between economics and reliability of an electric power system.
4. Compare various investment options in electricity markets.
5. Infer smart and intelligent domestic systems.

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**(A30214)ELECTRICAL MACHINES-II LAB****B.Tech EEE V Sem****L T P C  
0 0 3 1.5**

**Course Objective** This lab is an extension to Electrical Machines – I lab which facilitates to know the performance of transformers, Induction motors and synchronous motors

**The following experiments are required to be conducted as compulsory experiments:**

1. O.C. & S.C. Tests on Single phase Transformer
2. Sumpner's test on a pair of single phase transformers
3. Brake test on three phase Induction Motor
4. No-load & Blocked rotor tests on three phase Induction motor
5. Regulation of a three phase alternator by synchronous impedance & M.M.F. methods
6. V and Inverted V curves of a three phase synchronous motor.
7. Equivalent Circuit of a single phase induction motor
8. Determination of  $X_d$  and  $X_q$  of a salient pole synchronous machine

**In addition to the above eight experiments, atleast any two of the following experiments are required to be conducted from the following list:**

1. Parallel operation of Single phase Transformers
2. Separation of core losses of a single phase transformer
3. Scott connection of transformers
4. Regulation of three-phase alternator by Z.P.F. and A.S.A methods
5. Efficiency of a three-phase alternator
6. Heat run test on a bank of 3 Nos. of single phase Delta connected transformers
7. Measurement of sequence impedance of a three-phase alternator.



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**(A30215)CONTROL SYSTEMS & SIMULATION LAB****B.Tech EEE V Sem****L T P C  
0 0 3 1.5**

**Course Objective** This course aims to enforce the knowledge of different controlling techniques in open loop and closed loop systems. It also introduces the concept of MATLAB to simulate different frequency response plots

**The following experiments are required to be conducted as compulsory experiments:**

1. Time response of Second order system
2. Effect of feedback on DC servo motor
3. Transfer function of DC motor
4. Transfer function of DC generator
5. Characteristics of magnetic amplifiers
6. Characteristics of AC servo motor
7. PSPICE simulation of Op-Amp based Integrator and Differentiator circuits.
8. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB

**In addition to the above eight experiments, atleast any two of the following experiments are required to be conducted from the following list:**

1. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
2. State space model for classical transfer function using MATLAB – Verification.
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple
4. Boolean expressions and application of speed control of motor.
5. Effect of P, PD, PI, PID Controller on a second order systems
6. Temperature controller using PI

**Reference Books**

1. Simulation of Electrical and electronics Circuits using PSPICE – by M.H.Rashid, M/s PHI
2. Publications.

3. PSPICE A/D user's manual – Microsim, USA.
4. PSPICE reference guide – Microsim, USA.
5. MATLAB and its Tool Books user's manual and – Mathworks, USA.

**(A30017) INDIAN CONSTITUTION**

<b><math>\frac{L}{2}</math></b>	<b><math>\frac{T}{0}</math></b>	<b><math>\frac{P}{0}</math></b>	<b><math>\frac{C}{0}</math></b>
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**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, Lok Sabha, Rajya Sabha, 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](http://nptel.ac.in/courses/109104074/8)
2. [nptel.ac.in/courses/109104045/](http://nptel.ac.in/courses/109104045/)
3. [nptel.ac.in/courses/101104065/](http://nptel.ac.in/courses/101104065/)
4. [www.hss.iitb.ac.in/en/lecture-details](http://www.hss.iitb.ac.in/en/lecture-details)
5. [www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution](http://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. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State government and its administration.
3. Get acquainted with Local administration and Panchayati Raj.
4. Be aware of basic concepts and developments of Human Rights.
5. Gain knowledge on roles and functioning of Election Commission.

**(A30018) ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE**

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**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 framework and 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 by AmitJha Atlantic publishers,2002

**E-Resources:**

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

**Course Outcomes:**

After completion of the course, students will be able to:

1. Upon completion of the course, the students are expected to:
2. Understand the concept of Traditional knowledge and its importance
3. Know the need and importance of protecting traditional knowledge.
4. Know the various enactments related to the protection of traditional knowledge.
5. Understand the concepts of Intellectual property to protect the traditional knowledge.

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**(A30013)BUSINESS MANAGEMENT & FINANCIAL ANALYSIS****B.Tech EEE VI Sem****L T P C  
4 0 0 4****Course objectives**

1. To inculcate the students regarding the adoption and implementation of management principles.
2. To create a focus on the functional organizational structure and its coordination in organization.
3. To make the student understand the concepts of economics and managerial economics.
4. To develop the skills, abilities and competencies regarding cost reduction in various producing conditions.
5. To nurture the students about the financial world and investment decisions.

**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,



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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 & Wehrich: Essentials of Management, 6/e, TMH, 2005 Thomas N. Duening & John
3. M. Ivancevich Management—Principles and Guidelines, Biztantra, 2003.
4. Ambrish Gupta (2004), Financial Accounting for Management, Pearson Education, New Delhi, India.
5. Domnick Salvatore (2011), Managerial Economics in a Global Economy, 7th edition, Oxford University Press, United States of America.
6. Narayanaswamy (2005), Financial Accounting, A Managerial Perspective, Prentice Hall of India private Ltd, New Delhi, India.

7. 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,

1. Apply Knowledge of management theories & practices to solve business decisions
2. Ability to integrate functional departments of an organization
3. Ability to understand business environment for making critical decisions in a business.
4. Identifies factors involved in production and markets.
5. Ability to analyse financial position of a firm

**(A30421) MICROPROCESSORS & MICROCONTROLLERS****B.Tech EEE VI Sem****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, 2<sup>nd</sup> edition 2006.

2. Kenneth.J.Ayala,The 8051 Microcontroller, 3<sup>rd</sup> 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, 2<sup>nd</sup> 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, 2<sup>nd</sup> 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

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**(A30216)COMPUTER METHODS IN POWER SYSTEMS****B.Tech EEE VI Sem****L T P C  
3 00 3**

**Course Objective** This course introduces formation of Z bus of a transmission line, power flow studies by various methods. It also deals with short circuit analysis and analysis of power system for steady state and transient stability.

**Unit –I: POWER SYSTEM NETWORK MATRICES**

Graph Theory: Definitions, Bus Incidence Matrix, Ybus formation by Direct and Singular Transformation Methods, Numerical Problems.

Formation of ZBus: Partial network, Algorithm for the Modification of ZBus Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses (Derivations and Numerical Problems). - Modification of ZBus for the changes in network (Problems)

**Unit –II: POWER FLOW STUDIES & LOAD FLOWS** Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static load flow equations

**Load flow solutions using Gauss Seidel Method:** Acceleration Factor, Load flow solution with and without P-V buses, Algorithm and Flowchart. Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and finding Line Flows/Losses for the given Bus Voltages. **Newton**

**Raphson Method in Rectangular and Polar Co-Ordinates Form:** Load Flow Solution with or without PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart.

**Decoupled and Fast Decoupled Methods.** Comparison of Different Methods – DC load Flow

**Unit – III: SHORT CIRCUIT ANALYSIS PER-UNIT SYSTEM OF REPRESENTATION.** Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems.

**SYMMETRICAL FAULT ANALYSIS:** Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems.

**Unit –IV: SYMMETRICAL COMPONENT THEORY**

Symmetrical Component Transformation, Positive, Negative and Zero sequence components: Voltages, Currents and Impedances.

**Sequence Networks:** Positive, Negative and Zero sequence Networks, Numerical Problems. **Unsymmetrical Fault Analysis:** LG, LL, LLG faults with and without fault impedance, Numerical Problems.

**Unit –V: POWER SYSTEM STABILITY ANALYSIS STEADY STATE STABILITY ANALYSIS:**

Elementary concepts of Steady State, Dynamic and Transient Stabilities. Description of Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability and Methods to improve steady state stability. **Transient State Stability Analysis** Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation. - Solution of Swing Equation: Point-by-Point Method. Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

**TEXT BOOKS**

1. Computer Techniques in Power System Analysis, M.A.Pai, TMH Publications,
2. Computer techniques and models in power systems, K.Umarao. I.K.International.

**REFERENCE BOOKS**

1. Power System Analysis, PSR Murry, BS Publications.
2. Power system Analysis Operation and control, Abhijit Chakrabarth, SunitaHaldar, PHI.
3. Power System Analysis, HadiSaadat , TMH.
4. Modern Power System Analysis, TuranGonen, CRC Press.
5. Modern Power Systems Analysis, Xi — Fan Wang, Yonghua Song, Malcolm Living, Springer International.
6. Electrical Power Systems Analysis, Security and Deregulation, P.
7. Venkatesh, B. V. Manikandan, S. Charles Raja, A.Srinivasan, PHI. Modern Power system
8. Analysis, I.J.Nagrath&D.P.Kothari: Tata McGraw-Hill Publishing Company.
9. Power System Analysis, T. K. Nagasarkar, M. S. Sukhija. Oxford University Press.

**Course Outcomes:** Upon completion of the course, the student will be able to

1. Demonstrate the Power System Network Matrices
2. Illustrate the Power flow Studies and Load Flows
3. Analyze short circuit symmetrical faults on the power system
4. Examine unsymmetrical faults on the power system
5. Categorize steady state and transient state analysis

**(A30217)POWER SEMICONDUCTOR DRIVES****B.Tech EEE VI Sem****L T P C  
3 0 03**

Course Objectives:

- To introduce the drive system and operating modes of drive and its characteristics
- To understand Speed – Torque characteristics of different motor drives by various power
- converter topologies
- To appreciate the motoring and braking operations of drive
- To differentiate DC and AC drives

**UNIT-I: CONTROL OF DC MOTORS**

Introduction to Thyristor controlled Drives, Single Phase semi and fully controlled converters connected to d.c separately excited and d.c series motors – continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque Characteristics- Problems on Converter fed d.c motors.

Three phase semi and fully controlled converters connected to d.c separately excited and d.c series motors – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque characteristics – Problems.

**UNIT-II: FOUR QUADRANT OPERATION OF DC DRIVES**

Introduction to Four quadrant operation – Motoring operations, Electric Braking – Plugging, Dynamic, and Regenerative Braking operations. Four quadrant operation of D.C motors by single phase and three phase dual converters – Closed loop operation of DC motor (Block Diagram Only)

**UNIT-III: CONTROL OF DC MOTORS BY CHOPPERS:** Single quadrant, Two quadrant and four quadrant chopper fed dc separately excited and series motors – Continuous current operation – Output voltage and current wave forms – Speed and torque expressions – speed-torque characteristics – Problems on Chopper fed D.C Motors – Closed Loop operation ( Block Diagram Only)

**UNIT-III: CONTROL OF INDUCTION MOTOR  
STATOR SIDE CONTROL OF INDUCTION MOTOR**



Variable voltage characteristics-Control of Induction Motor by Ac Voltage Controllers – Waveforms –speed torque characteristics. Variable frequency characteristics-Variable frequency control of induction motor by Voltage source and current source inverter and cyclo converters- PWM control – Comparison of VSI and CSI operations –Speed torque characteristics – numerical problems on induction motor drives – Closed loop operation of induction motor drives (Block Diagram Only)

### **ROTOR SIDE CONTROL OF INDUCTION MOTOR**

Static rotor resistance control – Slip power recovery – Static Scherbius drive – Static Kramer Drive –their performance and speed torque characteristics – advantages, applications, problems.

### **UNIT-V: CONTROL OF SYNCHRONOUS MOTORS**

Separate control and self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI, CSI and cyclo converters. Load commutated CSI fed Synchronous Motor – Operation – Waveforms – speed torque characteristics – Applications – Advantages and Numerical Problems – Closed Loop control operation of synchronous motor drives (Block Diagram Only), variable frequency control -Cyclo converter, PWM based VSI& CSI.

### **TEXT BOOKS:**

1. “G K Dubey”, Fundamentals of Electric Drives, CRC Press, 2002.
2. “VedamSubramanyam”, Thyristor Control of Electric drives, Tata McGraw Hill Publications, 1987.

### **REFERENCE BOOKS:**

1. “S K Pillai”, A First course on Electrical Drives, New Age International (P) Ltd. 2nd Edition. 1989
2. “P. C. Sen”, Thyristor DC Drives, Wiley-Blackwell, 1981
3. “B. K. Bose”, Modern Power Electronics, and AC Drives, Pearson 2015.
4. “R. Krishnan”, Electric motor drives - modelling, Analysis and control, Prentice Hall PTR, 2001

**Course Outcomes:** After completion of this course the student is able to

1. Identify the drawbacks of speed control of motor by conventional methods.

2. Compare Phase controlled and chopper controlled DC drives speed-torque characteristics merits and demerits
3. Illustrate Ac motor drive speed–torque characteristics using different control strategies its merits and demerits
4. Explain Slip power recovery schemes

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**(A30234) ELECTRICAL DISTRIBUTION SYSTEMS  
PROFESSIONAL ELECTIVE-II****B.Tech EEE VI Sem****L T P C  
3 0 0 3****Course Objectives:**

- To distinguish between transmission and distribution systems
- To understand design considerations of feeders
- To compute voltage drop and power loss in feeders
- To understand protection of distribution systems
- To examine the power factor improvement and voltage control

**UNIT-I:****GENERAL CONCEPTS**

Introduction to distribution system, Distribution system planning, Factors effecting the Distributionsystem planning, Load modelling and characteristics. Coincidence factor - contribution factor – Lossfactor - Relationship between the load factor and loss factor. Load growth, Classification of loads(Residential, commercial, Agricultural and Industrial) and their characteristics.

**DISTRIBUTION FEEDERS:**

Design Considerations of Distribution Feeders: Radial, loop and network types of primary feeders, Introduction to low voltage distribution systems (LVDS) and High voltage distribution systems (HVDS), voltage levels, Factors effecting the feeder voltage level, feeder loading, Application of general circuit constants (A,B,C,D) to radial feeders, basic design practice of the secondary distribution system, secondary banking, secondary network types, secondary mains.

**UNIT-II:****SUBSTATIONS**

Location of Substations: Rating of distribution substation, service area with 'n' primary feeders. Benefits derived through optimal location of substations. Optimal location of Substations (Perpendicular bisector rule and X, Y co-ordinate method).

System Analysis: Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, manual methods of solution for radial networks, three phase balanced primary lines, analysis of non-three phase systems, method to analyse the distribution feeder cost.

**UNIT-III:**

**PROTECTION**

Objectives of distribution system protection, types of common faults and procedure for fault calculations, over current Protective Devices: Principle of operation of Fuses, Auto-Circuit Recloser - and Auto-line sectionalizers, and circuit breakers.

**COORDINATION:**

Coordination of Protective Devices: Objectives of protection coordination, general coordination procedure, Types of protection coordination: Fuse to Fuse, Auto-Recloser to Fuse, Circuit breaker to Fuse, Circuit breaker to Auto-Recloser.

**UNIT-IV:****COMPENSATION FOR POWER FACTOR IMPROVEMENT**

Capacitive compensation for power-factor control - Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), effect of series capacitors, difference between shunt and series capacitors, Calculation of Power factor correction, capacitor allocation – Economic justification of capacitors - Procedure to determine the best capacitor location.

**UNIT V: VOLTAGE CONTROL**

Voltage Control: Importance of voltage control, methods of voltage control, Equipment for voltage control, effect of shunt capacitors, effect of series capacitors, effect of AVB/AVR on voltage control, line drop compensation, voltage fluctuations.

**TEXT BOOKS:**

1. Turan Gonen, Electric Power Distribution system Engineering, CRC Press, 3rd Edition 2014.
2. V. Kamaraju, Electrical Power Distribution Systems, Tata Mc Graw Hill Publishing Company, 2<sup>nd</sup> edition, 2010.

**REFERENCE BOOKS:**

1. G. Ram Murthy, Electrical Power Distribution hand book, 2nd edition, University press 2004.
2. A.S. Pabla, Electric Power Distribution, Tata McGraw Hill Publishing Company, 6th edition, 2013.

**Course Outcomes:** After completion of this course, the student able to

1. Compare transmission and distribution line and design the feeders
2. Determine power loss and voltage drop of the feeders
3. Design protection of distribution systems
4. Demonstrate the importance of voltage control and power factor improvement



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**(A30235) NON CONVENTIONAL ENERGY SOURCES  
(PROFESSIONAL ELECTIVE-II)**

**B.Tech EEE VI Sem****L T P C  
3 0 0 3**

**Course Objective** It introduces solar energy its radiation, collection, storage and application. It also introduces the Wind energy, Biomass energy, geothermal energy and ocean energy as alternative energy sources.

**UNIT – I: 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, extra-terrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

**Solar energy collection:** Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

**Storage and applications:** Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

**UNIT-II: WIND ENERGY** Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

**UNIT-III: 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-IV: 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

**UNIT-V: DIRECT ENERGY CONVERSION**

Need for DEC, Carnot cycle, limitations, principles of DEC.

### **TEXT BOOKS**

1. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition.
2. Non-Conventional Energy Sources /G.D. Rai
3. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis.
4. Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford.

### **REFERENCE BOOKS**

1. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore.
2. Renewable Energy Technologies /Ramesh & Kumar /Narosa.
3. Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki, PHI.
4. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
5. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.

**Course Outcomes:** Upon the completion of this subject students will be able to

1. Illustrate solar radiation data and classify solar thermal collectors with their applications.
2. Explain wind energy conversion systems.
3. Explain basic principle and working of tidal, biomass, fuel cell and geothermal systems.
4. Demonstrate direct energy conversion.

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**(A30236)DIGITAL CONTROL SYSTEMS  
PROFESSIONAL ELECTIVE-II****B.Tech EEE VI Sem****L T P C  
3 0 0 3**

Course Objectives:

- To understand the fundamentals of digital control systems, z-transforms
- To understand state space representation of the control systems, concepts of controllability and observability
- To study the estimation of stability in different domains
- To understand the design of discrete time control systems, compensators, state feedback controllers, state observers through various transformations

**UNIT-I: DISCRETE REPRESENTATION OF CONTINUOUS SYSTEMS**

Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modelling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent.

**UNIT-II: DISCRETE SYSTEM ANALYSIS**

Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system.

**STABILITY OF DISCRETE TIME SYSTEM**

Stability analysis by Jury test. Stability analysis using bilinear transformation. Design of digital control system with dead beat response. Practical issues with dead beat response design.

**UNIT-III: STATE SPACE APPROACH FOR DISCRETE TIME SYSTEMS**

State space models of discrete systems, State space analysis. Lyapunov Stability. Controllability, reachability, Reconstructability and observability analysis. Effect of pole zero cancellation on the controllability & observability.



#### **UNIT-IV: DESIGN OF DIGITAL CONTROL SYSTEM**

Design of Discrete PID Controller, Design of discrete state feedback controller. Design of set point tracker. Design of Discrete Observer for LTI System. Design of Discrete compensator.

#### **UNIT-V: DISCRETE OUTPUT FEEDBACK CONTROL**

Design of discrete output feedback control. Fast output sampling (FOS) and periodic output feedback controller design for discrete time systems.

#### **TEXT BOOKS:**

1. K. Ogata, “Digital Control Engineering”, Prentice Hall, Englewood Cliffs, 1995.
2. M. Gopal, “Digital Control Engineering”, Wiley Eastern, 1988.

#### **REFERENCES:**

1. G. F. Franklin, J. D. Powell and M. L. Workman, “Digital Control of Dynamic Systems”, Addison-Wesley, 1998.
2. B.C. Kuo, “Digital Control System”, Holt, Rinehart and Winston, 1980.

**Course Outcomes:** At the end of this course, students will demonstrate the ability to

1. Explain discrete representation of LTI systems.
2. Analyze stability of open loop and closed loop discrete-time systems.
3. Design digital controllers.
4. Design state feedback and output feedback controllers.

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**(A30003)ADVANCED ENGLISH COMMUNICATIONS SKILLS  
LAB****B.Tech EEE VI Sem****L T P C  
0 0 3 1.5****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 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.

### **COURSE OUTCOMES**

On completion of the course students will be able to

1. Organize ideas relevantly and coherently.
2. Engage in debates.
3. Participate in group discussions.
4. Face interviews.
5. Write project/research reports/technical reports.
6. Make oral presentations.
7. Write formal letters.
8. Transfer information from non-verbal to verbal texts and vice versa.
9. Take part in social and professional communication.

**(A30218)POWER ELECTRONICS & SIMULATION LAB****B.Tech EEE VI Sem****L T P C  
0 0 3 1.5**

**Course Objective** This lab introduces the practical knowledge of power semiconductor devices, converters and choppers for different applications. The above converters also simulated in MATLAB and PSPICE and the waveforms will be compared.

**The following experiments are required to be conducted as compulsory experiments:**

1. Gate firing circuits for SCR's
2. Single Phase AC Voltage Controller with R and RL Loads
3. Single Phase fully controlled bridge converter with R and RL loads
4. DC Jones chopper with R and RL Loads
5. Single Phase Cycloconverter with R and RL loads
6. Single Phase half controlled converter with R load
7. Single Phase series inverter with R and RL loads
8. PSPICE simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE loads.

**In addition to the above eight experiments, atleast any two of the following experiments are required to be conducted from the following list:**

1. PSPICE simulation of resonant pulse commutation circuit and Buck chopper.
2. PSPICE simulation of single phase Inverter with PWM control.
3. Study of Characteristics of SCR, MOSFET & IGBT
4. Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E)
5. Three Phase half controlled bridge converter with R-load
6. Single Phase Bridge converter with R and RL loads
7. Single Phase dual converter with RL loads
8. Operation of MOSFET based chopper
9. Single Phase Parallel, inverter with R and RL loads

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**(A30014)ENVIRONMENTAL SCIENCES****B.Tech EEE VI Sem****L T P C  
2 0 0 0****Course Objectives: 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– In-situ 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, Equitable use 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.,

### **Reference books**

1. Environmental sciences and Engineering - P. Venugopal Rao, PHI learning Pvt. Ltd.,
2. Environmental Science and Technology by M. Anji Reddy, B S Publications.
3. Clark, R.S., Marine Pollution, Clarendon Press, Oxford, 2002.
4. 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

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**(A30237)HVDC TRANSMISSION  
PROFESSIONAL ELECTIVE-III****B.Tech EEE VII Sem****L T P C  
3 0 0 3****Course Objectives:**

- To compare EHV AC and HVDC systems
- To analyse Graetz circuit and also explain 6 and 12 pulse converters
- To control HVDC systems with various methods and to perform power flow analysis in AC/DC systems
- To describe various protection methods for HVDC systems and Harmonics

**UNIT-I: BASIC CONCEPTS:**Necessity of HVDC systems, Economics and Terminal equipment of HVDC transmission systems, Types of HVDC Links, Apparatus required for HVDC Systems, Comparison of AC and DC Transmission, Application of DC Transmission System, Planning and Modern trends in D.C. Transmission.

**ANALYSIS OF HVDC CONVERTERS:**Choice of Converter Configuration, Analysis of Graetz circuit, Characteristics of 6 Pulse and 12 Pulse converters, Cases of two 3 phase converters in Y/Y mode—their performance.

**UNIT-II: CONVERTER AND HVDC SYSTEM CONTROL**

Principle of DC Link Control, Converters Control Characteristics, Firing angle control, Current and extinction angle control, Effect of source inductance on the system, Starting and stopping of DC link, Power Control.

**REACTIVE POWER CONTROL IN HVDC:** Introduction, Reactive Power Requirements in steady state, sources of reactive power- Static VAR Compensators, Reactive power control during transients.

**UNIT-III: POWER FLOW ANALYSIS IN AC/DC SYSTEMS**

Modelling of DC Links, DC Network, DC Converter, Controller Equations, Solution of DC load flow, P.U. System for DC quantities, solution of AC-DC Power flow-Simultaneous method-Sequential method.

**UNIT-IV: CONVERTER FAULTS AND PROTECTION**

Converter faults, protection against over current and over voltage in converter station, surge arresters, smoothing reactors, DC breakers, Audible noise, space charge field, corona effects on DC lines, Radiointerference.

#### **UNIT-V: HARMONICS**

Generation of Harmonics, Characteristics harmonics, calculation of AC Harmonics, Non- Characteristic harmonics, adverse effects of harmonics, Calculation of voltage and Current harmonics, Effect of Pulse number on harmonics

**FILTERS:** Types of AC filters, Design of Single tuned filters –Design of High pass filters.

#### **TEXT BOOKS:**

1. “K. R. Padiyar”, HVDC Power Transmission Systems: Technology and system Interactions, New Age International (P) Limited, and Publishers, 1990.
2. “S K Kamakshiah, V Kamaraju”, HVDC Transmission, TMH Publishers, 2011

#### **REFERENCE BOOKS:**

1. “S. Rao”, EHVAC and HVDC Transmission Engineering and Practice, Khanna publications, 3<sup>rd</sup> Edition 1999.
2. “Jos Arrillaga”, HVDC Transmission, The institution of electrical engineers, IEE power & energy series 29, 2nd edition 1998.
3. “E. W. Kimbark”, Direct Current Transmission, John Wiley and Sons, volume 1, 1971.
4. “E. Uhlmann”, Power Transmission by Direct Current, B. S. Publications, 2009

**Course Outcomes:** After completion of this course the student is able to

1. Compare EHV AC and HVDC system and to describe various types of DC links
2. Analyse Graetz circuit for rectifier and inverter mode of operation
3. Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems
4. Describe various protection methods for HVDC systems and classify Harmonics and design different types of filters



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**(A30238)POWER SYSTEM OPERATION & CONTROL  
PROFESSIONAL ELECTIVE-III****B.Tech EEE VIISem****L T P C  
3 0 0 3**

**Course Objective** This subject deals with Economic operation of Power Systems, Hydrothermal scheduling and modelling of turbines, generators and automatic controllers. It emphasize on single area and two area load frequency control and reactive power control.

**UNIT – I: ECONOMIC OPERATION OF POWER SYSTEMS**

Optimal operation of Generators in Thermal Power Stations, - heat rate Curve – Cost Curve – Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation with line losses neglected. Optimum generation allocation including the effect of transmission line losses – Loss Coefficients, General transmission line loss formula.

**UNIT – II: HYDROTHERMAL SCHEDULING**

Optimal scheduling of Hydrothermal System: Hydroelectric power plant models, scheduling problems-Short term hydrothermal scheduling problem.

**UNIT –III: MODELLING OF TURBINE, GENERATOR AND CONTROLLERS**

**Modelling of Turbine:** First order Turbine model, Block Diagram representation of Steam Turbines and Approximate Linear Models.

**Modelling of Generator** (Steady State and Transient Models): Description of Simplified Network Model of a Synchronous Machine (Classical Model), Description of Swing Equation (No Derivation) and State-Space II-Order Mathematical Model of Synchronous Machine.

**Modelling of Governor:** Mathematical Modelling of Speed Governing System – Derivation of small signal transfer function.

**Modelling of Excitation System:** Fundamental Characteristics of an Excitation system, Transfer function, Block Diagram Representation of IEEE Type-1 Model

**UNIT – IV: SINGLE AREA &TWO-AREA LOAD FREQUENCY CONTROL**

Necessity of keeping frequency constant. Definitions of Control area – Single area control – Block diagram representation of an isolated

power system – Steady state analysis – Dynamic response – Uncontrolled case. Load frequency control of 2-area system – uncontrolled case and controlled case, tie-line bias control

### **Load Frequency Controllers**

Proportional plus Integral control of single area and its block diagram representation, steady state response, Load Frequency Control and Economic dispatch control.

## **UNIT – V: REACTIVE POWER CONTROL & SMART GRID**

Overview of Reactive Power control – Reactive Power compensation in transmission systems – advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation – Specifications of load compensator, Uncompensated and compensated transmission lines: shunt and Series Compensation.(Qualitative Treatment)

**Introduction to smart grids** Introduction to Smart Grid, Smart Grid architecture layers, Features of smart grid, Smart Grid Technology.

### **TEXT BOOKS**

1. Electrical Power Systems by C.L.Wadhwa, Newage International-3rd Edition
2. Modern Power System Analysis – by I.J.Nagrath&D.P.Kothari Tata M Graw – Hill Publishing
3. Company Ltd, 2nd edition.
4. Operation and Control in Power Systems, PSR Murthy, BS Publications.

### **REFERENCE BOOKS**

1. Electric Energy systems Theory – by O.I.Elgerd, Tata Mc Graw-hill Publishing Company Ltd., Second edition.
2. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
3. Power System Analysis by HadiSaadat – TMH Edition.
4. Power System Operation and Control, Dr. K. Uma Rao, Wiley India Pvt. Ltd.
5. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma., THOMPSON, 3rd Edition Cengage Learning

**Course Outcomes:** Upon the completion of this subject students will be able to

1. Estimate and Dispatch the load economically among thermal plants
2. Examine the hydrothermal scheduling.
3. Model turbine, generator, governor and excitation systems.
4. Describe single area and two area load frequency controls.
5. Interpret reactive power control and compensation and describe the features of smart grid

**(A30239)SWITCHED MODE POWER SUPPLY  
PROFESSIONAL ELECTIVE-III**

**B.Tech EEE VII Sem**

**L T P C  
3 0 0 3**

**OBJECTIVES**

- To design the reactive elements for power electronic systems.
- To discuss the concepts of switching converters.
- To explain the operation of resonant converters.
- To discuss the operation of transformerized switching converters.
- To distinguish various types of UPS and filters.

**UNIT-I: INTRODUCTION**

Reactive elements – Design of Inductor, capacitor and transformer for Power electronics applications.

**UNIT-II: BASIC SWITCHING CONVERTER TOPOLOGIES**

Basic concepts of SMPS – DC-DC converters – Characteristics – Constituent elements – Operating principles.

**UNIT-III: RESONANT CONVERTERS**

Classification of resonant converters – Basic resonant circuit concepts – Load resonant converters – Resonant switches converters – Zero voltage switching.

**UNIT-IV: TRANSFORMERIZED SWITCHING CONVERTERS**

Forward converter – Push-pull converter – Half-bridge switching converter – Full – bridge switching converter – Flyback converter – Zero-Current- Switching Quasi-Resonant Half-Bridge converter

**UNIT-V: POWER CONDITIONERS, UPS AND FILTERS**

Power line disturbances – Power conditioners – Offline and Online UPS, Applications – Voltage filters, Series-parallel resonant filters, filter for PWM VSI, current filter, DC filters.

**TEXT BOOKS**

1. Simon S. Ang, “Power Switching Converter”, Marcel Dekker Inc., Taylor and Francis,3rd
2. Edition,2005.
3. Umanand L., Bhat S.R., “Design of magnetic components for switched Mode Power converters” ,
4. Wiley Eastern Ltd.,2001.

**Course Outcomes:**

Upon completion of this subject students will be able to

1. Design the reactive elements for power electronic systems.
2. Describe the switching converter concepts.
3. Demonstrate the resonant converter operation.
4. Illustrate the operation of transformerized switching converters.
5. Compare various types of UPS and filters

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**(A30240)HIGH VOLTAGE ENGINEERING  
PROFESSIONAL ELECTIVE-IV**

**B.Tech EEE VII Sem****L T P C  
3 0 0 3****Course Objectives:**

- To deal with the detailed analysis of Breakdown occurring in gaseous, liquids and solid dielectrics
- To inform about generation and measurement of High voltage and current
- To introduce High voltage testing methods

**UNIT-I: BREAKDOWN IN GASES**

Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streamer mechanism, Corona discharge

**BREAKDOWN IN LIQUID AND SOLID INSULATING MATERIALS**

Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic

Breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.

**UNIT-II: GENERATION OF HIGH VOLTAGES**

Generation of high voltages, generation of high D. C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

**UNIT-III: MEASUREMENTS OF HIGH VOLTAGES AND CURRENTS**

Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements.

**UNIT-IV: LIGHTNING AND SWITCHING OVER-VOLTAGES**

Charge formation in clouds, Stepped leader, Dart leader, Lightning Surges. Switching overvoltages, Protection against over-voltages, Surge diverters, Surge modifiers.

**UNIT-V: HIGH VOLTAGE TESTING OF ELECTRICAL APPARATUS AND HIGH VOLTAGE LABORATORIES**

Various standards for HV Testing of electrical apparatus, IS, IEC standards, Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformers and some high voltage equipment, High voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H. V. Labs.

**TEXT BOOKS:**

1. M. S. Naidu and V. Kamaraju, "High Voltage Engineering", McGraw Hill Education, 2013.
2. C. L. Wadhwa, "High Voltage Engineering", New Age International Publishers, 2007.

**REFERENCES:**

1. D. V. Razevig (Translated by Dr. M. P. Chourasia), "High Voltage Engineering Fundamentals", Khanna Publishers, 1993.
2. E. Kuffel, W. S. Zaengl and J. Kuffel, "High Voltage Engineering Fundamentals", Newnes Publication, 2000.
3. R. Arora and W. Mosch "High Voltage and Electrical Insulation Engineering", John Wiley & Sons, 2011.
4. Various IS standards for HV Laboratory Techniques and Test

**Course outcomes:** At the end of the course, the student will demonstrate

1. Explain the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials.
2. Demonstrate the generation and measurement of D. C., A.C., & Impulse voltages.
3. Explain the tests on H. V. equipment and on insulating materials, as per the standards.
4. Illustrate the concept of how over-voltages arise in a power system, and protection against these over voltages.

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**(A30241)POWER QUALITY  
PROFESSIONAL ELECTIVE-IV**

**B.Tech EEE VIISem**

**LT P C  
3 0 0 3**

**Course Objectives**

- To know different terms of power quality.
- To Illustrate of voltage power quality issue – short and long interruption
- To construct study of characterization of voltage sag magnitude and three phase unbalanced voltage sag.
- To know the behaviour of power electronics loads; induction motors, synchronous motor etc by the power quality issues
- To prepare mitigation of power quality issues by the VSI converters.

**UNIT-I: INTRODUCTION**

Introduction of the Power Quality (PQ) problem, Terms used in PQ: Voltage, Sag, Swell, Surges, Harmonics, over voltages, spikes, Voltage fluctuations, Transients, Interruption, overview of power quality phenomenon, Remedies to improve power quality, power quality monitoring.

**UNIT-II: LONG & SHORT INTERRUPTIONS**

Interruptions – Definition – Difference between failures, outage, Interruptions – causes of Long Interruptions – Origin of Interruptions – Limits for the Interruption frequency – Limits for the interruption duration – costs of Interruption – Overview of Reliability evaluation to power quality, comparison of observations and reliability evaluation. Short interruptions: definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, voltage during the interruption, monitoring of short interruptions, difference between medium and low voltage systems. Multiple events, single phase tripping – voltage and current during fault period, voltage and current at post fault period, stochastic prediction of short interruptions.



**UNIT III: 1 & 3-PHASE VOLTAGE SAG CHARACTERIZATION**

Voltage sag – definition, causes of voltage sag, voltage sag magnitude, and monitoring, theoretical calculation of voltage sag magnitude, voltage sag calculation in non-radial systems, meshed systems, and voltage sag duration. Three phase faults, phase angle jumps, magnitude and phase angle jumps for three phase unbalanced sags, load influence on voltage sags.

**UNIT-IV: POWER QUALITY CONSIDERATIONS IN INDUSTRIAL POWER SYSTEMS**

Voltage sag – equipment behaviour of Power electronic loads, induction motors, synchronous motors, computers, consumer electronics, adjustable speed AC drives and its operation. Mitigation of AC Drives, adjustable speed DC drives and its operation, mitigation methods of DC drives.

**UNIT-V: MITIGATION OF INTERRUPTIONS & VOLTAGE SAGS**

Overview of mitigation methods – from fault to trip, reducing the number of faults, reducing the fault clearing time changing the power system, installing mitigation equipment, improving equipment immunity, different events and mitigation methods. System equipment interface – voltage source converter, series voltage controller, shunt controller, combined shunt and series controller. Power Quality and EMC Standards: Introduction to standardization, IEC Electromagnetic compatibility standards, European voltage characteristics standards, PQ surveys.

**TEXTBOOKS:**

1. Math H J Bollen “Understanding Power Quality Problems”, IEEE Press.
2. R.C. Dugan, M.F. Mc Granaghan and H.W. Beaty, “Electric Power Systems Quality.” New York: McGraw-Hill. 1996

**REFERENCE BOOKS:**

1. G.T. Heydt, ‘Electric Power Quality’, 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994).
2. Power Quality VAR Compensation in Power Systems, R. Sastry Vedam Mulukutla S. Sarma, CRC Press.
3. A Ghosh, G. Ledwich, Power Quality Enhancement Using Custom Power Devices. Kluwer Academic, 2002

**Course Outcomes:** Upon the completion of the subject, the student will be able to

1. Know the severity of power quality problems in distribution system;
2. Understand the concept of voltage sag transformation from up-stream (higher voltages) to down-stream (lower voltage)
3. compute the concept of improving the power quality to sensitive load by various mitigating custom power devices

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**(A30242)UTILIZATION OF ELECTRICAL ENERGY  
PROFESSIONAL ELECTIVE-IV****B.Tech EEE VIISem****L T P C  
3 0 0 3**

**Course Objective** This subject deals with the fundamentals of illumination and its classification and the electric heating and welding. It gives the detailed study of all varieties of Electric drives and their application to electrical traction systems.

**UNIT – I: ELECTRIC DRIVES**

Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

**UNIT – II: ELECTRIC HEATING & WELDING**

Electric heating: Advantages and methods of electric heating, resistance heating induction heating and dielectric heating. Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

**UNIT – III: ILLUMINATION**

Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light.

**Various illumination methods** Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting. LED Lighting

**UNIT – IV: ELECTRIC TRACTION – I**

System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking-plugging rheostat braking and regenerative braking. Mechanics of train movement. Speed-time curve for different services –

## **UNIT – V: ELECTRIC TRACTION-II**

Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation, adhesive weight and coefficient of adhesion.

### **TEXT BOOKS**

1. Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman.
2. Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age
3. International (P) Limited, Publishers, 1997.

### **REFERENCE BOOKS**

1. Utilization of Electrical Power including Electric drives and Electric traction – by
2. N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
3. Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai & Sons.

**Course Outcomes:** Upon the completion of this subject students will be able to

1. Choose a right drive for a particular application.
2. Illustrate different types of Electric Heating , Welding and Illumination
3. Explain the basic fundamental of electric traction
4. Demonstrate the mechanics of Train movement.
5. Explain trapezoidal and quadrilateral speed time curves and demonstrate specify energy consumption

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**(A30243) FACTS DEVICES  
PROFESSIONAL ELECTIVE-V**

**B.Tech EEE VII Sem**

**LT P C  
3 0 0 3**

**Course Objective:** It deals with basic FACTS concepts, static shunt and series compensation and combined compensation techniques.

**UNIT-I: FACTS CONCEPTS**

Transmission interconnections power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters basic types of FACTS controllers, benefits from FACTS controllers.

**UNIT-II: VOLTAGE SOURCE CONVERTERS**

Single phase three phase full wave bridge converters transformer connections for 12 pulse 24 and 48 pulse operation. Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, and comparison of current source converters with voltage source converters.

**UNIT-III: STATIC SHUNT COMPENSATION**

Objectives of shunt compensation, mid-point voltage regulation voltage instability prevention, improvement of transient stability, Power oscillation damping, Methods of controllable VAR generation, variable impedance type static VAR generators switching converter type VAR generators hybrid VAR generators.

**UNIT-IV: SVC AND STATCOM**

The regulation and slope transfer function and dynamic performance, transient stability enhancement and power oscillation damping operating point control and summary of compensator control.

**UNIT-V: STATIC SERIES COMPENSATORS**

Concept of series capacitive compensation, improvement of transient stability, power oscillation damping, and functional requirements of GTO thyristor controlled series capacitor (GSC), thyristor switched capacitor (TSSC), and thyristor controlled series capacitor (TCSC) Control schemes for GSC TSSC and TCSC.

**TEXT BOOKS**

1. Understanding FACTS, Concepts and Technology of Flexible AC Transmission Systems, Narain. G. Hingorani, Laszlo Gyugyi, IEEE Press, Wiley India.
2. Facts Controllers In Power Transmission and Distribution · Padiyar, K.R. New Age International

### **REFERENCE BOOKS**

1. Thyristor — Based Conrollers for Electrical Transmission Systems, R.Mohan Mathur, Rajiv K. Varma.Wiley India.
2. FACTS Modeling and Simulation in Power Networks, Enrique Acha, Wiley India Distributed by BSP Books Pvt. Ltd.

**Course Outcomes:** By the completion of this course students will be able to

1. Choose proper controller for the specific application based on system requirements
2. Explain the control circuits of Shunt Controllers SVC & STATCOM for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping
3. Explain the Power and control circuits of Series Controllers GCSC, TSSC and TCSC

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**(A30244) RELIABILITY ENGINEERING  
PROFESSIONAL ELECTIVE-V**

**B.Tech EEE VII Sem****LT P C  
3 0 0 3****Course Objectives:**

- To introduce the basic concepts of reliability, various models of reliability
- To analyze reliability of various systems
- To introduce techniques of frequency and duration for reliability evaluation of repairable systems.

**UNIT – I: BASIC PROBABILITY THEORY**

Elements of probability, probability distributions, Random variables, Density and Distribution functions- Binomial distribution- Expected value and standard deviation - Binomial distribution, Poisson distribution, normal distribution, exponential distribution, Weibull distribution.

**Definition of Reliability:** Definition of terms used in reliability, Component reliability, Hazard rate, derivation of the reliability function in terms of the hazard rate. Hazard models - Bath tub curve, Effect of preventive maintenance. Measures of reliability: Mean Time to Failure and Mean Time between Failures.

**UNIT – II: NETWORK MODELING AND EVALUATION OF SIMPLE SYSTEMS**

Basic concepts- Evaluation of network Reliability / Unreliability - Series systems, Parallel systems- Series-Parallel systems- Partially redundant systems- Examples.

**Network Modeling and Evaluation of Complex systems:** Conditional probability method, set, Cutset approach- Event tree and reduced event tree methods- Relationships between tie and cutsets- Examples.

**UNIT – III: TIME DEPENDENT PROBABILITY**

Basic concepts- Reliability function  $f(t)$ .  $F(t)$ ,  $R(t)$  and  $h(t)$  - Relationship between these functions.

**Network Reliability Evaluation Using Probability Distributions:** Reliability Evaluation of Series systems, Parallel systems - Partially redundant systems- determination of reliability measure- MTTF for series and parallel systems - Examples.

#### **UNIT – IV: DISCRETE MARKOV CHAINS**

Basic concepts- Stochastic transitional probability matrix- time dependent probability evaluation- Limiting State Probability evaluation- Absorbing states –Examples

**Continuous Markov Processes:** Modeling concepts- State space diagrams- Unreliabilityevaluation of single and two component repairable systems

#### **UNIT – V: FREQUENCY AND DURATION TECHNIQUES**

Frequency and duration concepts, application tomulti state problems, Frequency balance approach.

**Approximate System Reliability Evaluation:** Series systems – Parallel systems- Networkreduction techniques- Cut set approach- Common mode failures modeling and evaluationtechniques- Examples.

#### **TEXT BOOKS:**

1. Roy Billinton and Ronald N Allan, Reliability Evaluation of Engineering Systems,Plenum Press, 1983.
2. E. Balagurusamy, Reliability Engineering by Tata McGraw-Hill Publishing CompanyLimited, 2002.

#### **REFERENCE BOOK:**

1. K. K. Agarwal, Reliability Engineering-Kluwer Academic Publishers, 1993.

**Course Outcomes:** After completion of this course, the student will be able to

1. Model various systems applying reliability networks
2. Evaluate the reliability of simple and complex systems
3. Estimate the limiting state probabilities of repairable systems
4. Apply various mathematical models for evaluating reliability of irreparable systems



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**(A30245) ADVANCED ELECTRICAL DRIVES  
PROFESSIONAL ELECTIVE-IV****B.Tech EEE VIISem****LT P C  
3 0 0 3**

Course Objectives:

- To know the power electronic converters
- To analyze the various control strategies of power converters for drives control
- To understand the advanced control techniques for DC and AC motor drives
- To go through the control strategies for drives using digital signal processors.

**UNIT-I: POWER CONVERTERS FOR AC DRIVES**

PWM control of inverter, selected harmonic elimination, space vector modulation, current control of VSI, three level inverter, Different topologies, SVM for 3 level inverter, Diode rectifier with boost chopper, PWM converter as line side rectifier, current fed inverters with self-commutated devices. Control of CSI, H Bridge as a 4-Q drive.

**UNIT-II: INDUCTION MOTOR DRIVES**

Different transformations and reference frame theory, modelling of induction machines, voltage fed inverter control-v/f control, vector control, direct torque and flux control (DTC).

**UNIT-III: SYNCHRONOUS MOTOR DRIVES**

Modelling of synchronous machines, open loop v/f control, vector control, direct torque control, CSI fed synchronous motor drives.

**UNIT-IV: PERMANENT MAGNET MOTOR DRIVES**

Introduction to various PM motors, BLDC and PMSM drive configuration, comparison, block diagrams, Speed and torque control in BLDC and PMSM.

**SWITCHED RELUCTANCE MOTOR DRIVES**

Evolution of switched reluctance motors; various topologies for SRM drives, comparison, closed loop speed and torque control of SRM.

### **UNIT-V: DSP BASED MOTION CONTROL**

Use of DSPs in motion control, various DSPs available, and realization of some basic blocks in DSP for implementation of DSP based motion control.

#### **TEXT BOOKS:**

1. B. K. Bose, “Modern Power Electronics and AC Drives”, Pearson Education, Asia, 2003.
2. P. C. Krause, O. Wasynczuk and S. D. Sudhoff, “Analysis of Electric Machinery and DriveSystems”, John Wiley & Sons, 2013.

#### **REFERENCES:**

1. H. A. Taliyat and S. G. Campbell, “DSP based Electromechanical Motion Control”, CRC press,2003.
2. R. Krishnan, “Permanent Magnet Synchronous and Brushless DC motor Drives”, CRC Press, 2009

**Course Outcomes:**At the end of this course, students will demonstrate the ability to

1. Understand the operation of power electronic converters and their control strategies.
2. Understand the vector control strategies for ac motor drives
3. Understand the implementation of the control strategies using digital signal processors.

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**(A30471) PRINCIPLES OF ELECTRONIC  
COMMUNICATIONS  
(Open Elective-I offered by ECE)**

**B.Tech EEE VII Sem**

**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, 20<sup>th</sup> reprint, 2004.
2. Principles of Communication Systems – H Taub& D. Schilling, GautamSahe, TMH, 3<sup>rd</sup> 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- 5<sup>th</sup> Edition, Mcgarw- Hill,2008.

**Course Outcomes**

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

1. Understand the concept of Communication systems.
2. Describe 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

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**(A30472)BASIC ELECTRONICS ENGINEERING**  
**(Open Elective-I offered by ECE)**

**B.Tech EEE VII Sem**

**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  $\beta$ , 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. Understand and analyze the different types of diodes and its characteristics.
2. Construct various rectifiers and filters.
3. Analyze the characteristics of BJT & FET.
4. Design the DC bias circuitry of BJT and FET.

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**(A30554) JAVA PROGRAMMING**  
**(Open Elective-I offered by CSE)**

**B.Tech EEE VII Sem**

**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



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**(A30531)PYTHON PROGRAMMING**  
**(Open Elective-I offered by CSE)****B.Tech EEE VII Sem****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 RGB 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. 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
2. Dictionaries in Python
3. Express different Decision-Making statements and Functions
4. Interpret Object oriented programming in Python
5. summarize different File handling operations
6. Explain how to design GUI Applications in Python and evaluate different database Operations.

**(A30383) FUNDAMENTALS OF ENGINEERING MATERIALS**  
**(Open Elective-I Offered by Mechanical)**

**B.Tech EEE VII Sem**

**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-Fe<sub>3</sub>C 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.

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**(A30377) BASICS OF THERMODYNAMICS**  
**(Open Elective-I offered by Mechanical)**

**B.Tech EEE VII Sem**

**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 ( $c_p$  and  $c_v$ ), 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 fraction 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.

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**(A30160) DISASTER MANAGEMENT AND MITIGATION**  
**(Open Elective-I offered by Civil)**

**B.Tech EEE VII Sem**

**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 - Endogenous 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>)



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**(A30161) REMOTE SENSING AND GIS**  
**(Open Elective-I offered by Civil)**

**B.Tech EEE VII Sem**

**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.

**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
6. Create GIS and cartographic outputs for presentation

**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-Hill2015

**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.

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**(C30161) LOGISTICS AND SUPPLY CHAIN MANAGEMENT**  
**(Open Elective-I offered by MBA)**

**B.Tech EEE VII Sem**

**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 – 1**

**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 proposition, 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 – 2**

**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 – 3**

**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 – 4**

**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- 5**

**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**

- Sunil Chopra and Peter Meindl: Supply chain Management: Strategy, Planning and Operation, Third edition, Pearson, 2009.
- Donald J.Bowersox and David J.Closs: Logistical Management: The Integrated Supply Chain Process, TMH, 2006.
- Rajasekhar & Acharyulu: Logistics and Supply Chain Management, Excel, 2009.
- Sridhara Bhat: Logistics and supply chain management, Himalaya, 2009.
- John T Mentzer: Supply Chain Management, Sage Publications, 2008
- Donal Waters: Global Logistics, Kogan Page, 2009
- Christain schuh et al:The purchasing chess board, Springer link,2009.
- Philip B.Schary, Tage Skjott-Larsen: Managing the Global Supply Chain, Viva, 2008.

- Joel D wisner, Keong Leong, Keah Choon Tan: Principles of Supply Chain Management- A Balanced approach, Cengage Learning, 2008
- Rahul V Altekhar: Supply Chain Management, Concepts and Cases, PHI , 2008
- J.L.Gattorna and D.W.Walters: Managing the Supply Chain, Macmillan, 2008
- Rangaraj: Supply chain Management for competitive advantage, TMH, 2009
- Kachru: Logistics and Supply Chain Management, Excel, 2009
- 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.

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**(C30162)KNOWLEDGE MANAGEMENT**  
**(Open Elective-I offered by MBA)**

**B.Tech EEE VII Sem**

**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 1**

**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 2**

**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 3: 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 4**

**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 5**

**Implementation of Knowledge Management:** Discussion on Roadblocks to success, 10-step KM Road Map of Amrit Tiwana, 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. Implementing the ethical implications in managing knowledge.



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**(A30473) IMAGE PROCESSING**  
**(Open Elective-II offered by ECE)**

**B.Tech EEE VII Sem**

**LT P C**  
**3 0 0 3**

**Unit- I: Digital Image Fundamentals**

Digital Image fundamentals, Components of Digital Image Processing, Sampling and Quantization, 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, Rechar E. Woods, 3<sup>rd</sup> 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, 2<sup>nd</sup> 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, 2<sup>nd</sup> 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 fundamentals of digital image processing.
2. Distinguish between spatial domain enhancement and frequency domain enhancement.
3. Analyze the image restoration and segmentation methods.
4. Discriminate between lossless and lossy compression techniques

**(A30474)DIGITAL ELECTRONICS**  
**(Open Elective-II offered by ECE)**

**B.Tech EEE VII Sem**

**LT 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 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, Arithmetic Circuits, Comparator, Multiplexer, Code-converters.

**UNIT-III:**

**SEQUENTIAL MACHINES FUNDAMENTALS**

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 – Zvi Kohavi, & 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 \_ Frediac 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, 3<sup>rd</sup>, oxford, 2013.

**Course Outcomes**

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

1. Understand the various number systems and conversions.
2. Solve the Boolean expressions using Boolean laws and minimization techniques.
3. Design and analyze the combinational circuits.
4. Design and analyze the sequential circuits.

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**(A30555)INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS****(Open Elective-II offered by CSE)****B.Tech EEE VII Sem****LT 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, Subqueries, 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. Ramez Elmasri, 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,
5. Functions, and Packages, Triggers.
6. Explain the purpose of normalization and types Normal forms.

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**(A30537)DATA ANALYTICS WITH R**  
**(Open Elective-II offered by CSE)**

**B.Tech EEE VII Sem**

**LT 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
3. 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. Write simple applications using R programming language constructs.
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.



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**(A30357) FUNDAMENTALS OF MANUFACTURING  
PROCESSES****(Open Elective-II offered by Mechanical)****B.Tech EEE VII Sem****LT 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.

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**(A30379) FUNDAMENTALS OF AUTOMOBILE  
ENGINEERING**  
**(Open Elective-II offered by Mechanical)**

**B.Tech EEE VII Sem**

**LT 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

**(A30162) GREEN BUILDINGS  
(Open Elective-II offered by Civil)**

**B.Tech EEE VII Sem**

**LT 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 envelope material 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.

**Course Outcomes**

1. An understanding on sustainability.
2. Knowledge on renewable energy conservation through material usage.
3. A thorough understanding on designing green buildings.

**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; Thamesand Hudson, 1996.

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**(A30163) AIR POLLUTION AND CONTROL**  
**(Open Elective-II offered by Civil)**

**B.Tech EEE VII Sem**

**LT 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 (PM<sub>2.5</sub>, PM<sub>10</sub>, SO<sub>x</sub>, NO<sub>x</sub>, CO, NH<sub>3</sub>). 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.

**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.

**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.



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**(C30163)MANAGEMENT OF INDUSTRIAL RELATIONS**  
**(Open Elective-II offered by MBA)**

**B.Tech EEE VII Sem**

**LT 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, tripotism, 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. Arun Monappa,Ranjeet Nambudiri,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. Punekar S.D,Deodhar S.B, Saras wathi Sankaren”Labour Welfare,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. Venkata Ratnam “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.

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**(C30164) ENTREPRENEURSHIP**  
**(Open Elective-II offered by MBA)**

**B.Tech EEE VII Sem**

**LT 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 century 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](http://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” 6<sup>th</sup> 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.

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**(A30219) ELECTRICAL MEASUREMENTS LAB****B.Tech EEE VII Sem****L T P C  
0 0 3 1.5**

**Course Objective** This lab introduces the different calibration techniques of different meters and three phase reactive power measurement. It also aims at measurement of different parameters using bridges, potentiometers and transducers

**The following experiments are required to be conducted as compulsory experiments:**

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer power factor meter
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter
4. Kelvin's double Bridge – Measurement of resistance –
5. Determination of Tolerance.
6. Dielectric oil testing using H.T testing Kit
7. Schering bridge & Anderson bridge.
8. Measurement of 3 phases reactive power with single-phase wattmeter.
9. Measurement of parameters of a choke coil using 3 voltmeter and ammeter methods

**In addition to the above eight experiments, atleast any two of the experiments from the following list are required to be conducted:**

1. Calibration LPF wattmeter – by Phantom testing
2. Measurement of 3 phase power with single watt meter and 2 No's of C.T.
3. C.T testing using mutual Inductor-Measurement of % ratio error and phase angle of given
4. C.T by Null method
5. P.T. testing by comparison-V.G as Null detector-Measurement of % ratio error and phase angle of the given P.T.
6. LVDT and capacitance pickup-characteristics and Calibration
7. Resistance strain gauge-strain measurements and Calibration

**(A30422) MICROPROCESSORS & MICROCONTROLLERS  
LAB****B.Tech EEE VII Sem****L T P C****0 0 01.5****Note:** Minimum of 12 experiments are to be conducted.**List of Experiments**

The following programs /experiments are to be executed in Microsoft 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**

1. At the end of the course the student will be able to:
2. Describe the internal organization of 8086 Microprocessor and 8051 Microcontroller.
3. Analyze the interfacing of 8086 microprocessor and 8051 microcontroller
4. Design Microprocessors / Microcontrollers-based systems

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**(A30246) ELECTRICAL ENERGY CONSERVATION &  
AUDITING  
PROFESSIONAL ELECTIVE-VI**

**B.Tech EEE VIII Sem**

**L T P C  
3 0 0 3**

**Course Outcomes:**

At the end of this course, students will demonstrate the ability to

- Understand the current energy scenario and importance of energy conservation.
- Understand the concepts of energy management.
- Understand the methods of improving energy efficiency in different electrical systems.
- Understand the concepts of different energy efficient devices.

**UNIT -I: ENERGY SCENARIO**

Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features.

**UNIT -II: BASICS OF ENERGY AND ITS VARIOUS FORMS**

Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion.

**UNIT-III: ENERGY MANAGEMENT & AUDIT**

Definition, energy audit, need, types of energy audit. Energy management (audit) approach understanding energy costs, benchmarking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

**UNIT -IV: ENERGY EFFICIENCY IN ELECTRICAL SYSTEMS**

Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit,

selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

#### **UNIT-V: ENERGY EFFICIENT TECHNOLOGIES IN ELECTRICAL SYSTEMS**

Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

#### **Text/Reference Books**

1. Guide books for National Certification Examination for Energy Manager / Energy
2. Auditors Book-1, General Aspects (available online)
3. Guide books for National Certification Examination for Energy Manager / Energy
4. Auditors Book-3, Electrical Utilities (available online)
5. S. C. Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1991.
6. Success stories of Energy Conservation by BEE, New Delhi ([www.bee-india.org](http://www.bee-india.org))



**(A30231) AI TECHNIQUES IN ELECTRICAL  
ENGINEERING  
PROFESSIONAL ELECTIVE-1V**

**B.Tech EEE VIII Sem**

**L T P C  
3 0 0 3**

Pre-requisites: Power Systems Operation and Control

**Course Objectives:**

- To locate soft commanding methodologies, such as artificial neural networks, Fuzzy logic and genetic Algorithms.
- To observe the concepts of feed forward neural networks and about feedback neural networks.
- To practice the concept of fuzziness involved in various systems and comprehensive knowledge of fuzzy
- To analyze genetic algorithm, genetic operations and genetic mutations.

**UNIT-I: ARTIFICIAL NEURAL NETWORKS**

Introduction, Models of Neuron Network-Architectures –Knowledge representation, Artificial Intelligence and Neural networks–Learning process-Error correction learning, Hebbian learning – Competitive learning-Boltzman learning, supervised learning-Unsupervised learning–Reinforcement Learning -Learning tasks.

**UNIT-II: ANN PARADIGMS**

Multi-layer perceptron using Back propagation Algorithm (BPA), Self –Organizing Map (SOM), Radial Basis Function Network-Functional Link Network (FLN), Hopfield Network.

**UNIT-III: FUZZY LOGIC**

Introduction –Fuzzy versus crisp, Fuzzy sets-Membership function – Basic Fuzzy set operations, Properties of Fuzzy sets –Fuzzy Cartesian Product, Operations on Fuzzy relations –Fuzzy logic–Fuzzy Quantifiers, Fuzzy Inference-Fuzzy Rule based system, Defuzzification methods.

**UNIT-IV: GENETIC ALGORITHMS**

Introduction-Encoding –Fitness Function-Reproduction operators, Genetic Modeling –Genetic operators-Cross over-Single site cross over, Two point cross over –Multi point cross over Uniform cross over,

Matrix cross over-Cross over Rate-Inversion & Deletion, Mutation operator –Mutation –Mutation Rate-Bit-wise operators, Generational cycle-convergence of Genetic Algorithm.

#### **UNIT-V: APPLICATIONS OF AI TECHNIQUES**

Load forecasting, Load flow studies, Economic load dispatch, Load frequency control, Single area system and two area system, Reactive power control , Speed control of DC and AC Motors.

#### **TEXT BOOKS**

1. S.Rajasekaran and G.A.V.Pai Neural Networks, Fuzzy Logic & Genetic Algorithms, PHI, NewDelhi, 2003.
2. Rober J. Schalkoff, Artificial Neural Networks, Tata McGraw Hill Edition, 2011.

#### **REFERENCES BOOKS:**

1. P.D.Wasserman; Neural Computing Theory & Practice, Van Nostrand Reinhold, New York,
2. 1989.
3. Bart Kosko; Neural Network & Fuzzy System, Prentice Hall, 1992
4. D.E.Goldberg, Genetic Algorithms, Addison-Wesley 1999.

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

1. Understand feed forward neural networks, feedback neural networks and learning techniques.
2. Understand fuzziness involved in various systems and fuzzy set theory.
3. Develop fuzzy logic control for applications in electrical engineering
4. Develop genetic algorithm for applications in electrical engineering.

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**(A30413) DIGITAL SIGNAL PROCESSING  
PROFESSIONAL ELECTIVE-VI**

**B.Tech EEE VIII Sem**

**L T P C  
3 0 0 3**

**UNIT- I: INTRODUCTION: 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 filter 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,
2. DimitrisG.Manolakis, Pearson Education /PHI, 2007.
3. Discrete Time Signal Processing - A.V. Oppenheim and R.W.Schaffer, PHI, 2009.
4. 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.

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**(A30475) DATA COMMUNICATIONS**  
**(Open Elective-III offered by ECE)**

**B.Tech EEE VIII Sem**

**LT 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, Second edition 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. Attain the knowledge on basic concepts of data communication systems.
2. Explain the elements of data communications systems, different types of transmission medias and different digital modulation techniques
3. Attain the knowledge on different telephone instruments, signal and circuits
4. Describe different error detecting and correcting codes.

**(A30476) MICROCONTROLLERS & APPLICATIONS**  
**(Open Elective-III offered by ECE)**

**B.Tech EEE VIII Sem**

**L T P C**  
**3 0 0 3**

**UNIT-I**

**Introduction to Microprocessors and Microcontrollers:** Introduction to Microprocessor and Micro Controller, 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 External 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 (2<sup>nd</sup> Edition)

**Course Outcomes:**

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

1. Describe the architecture of 8085 and 8086 microprocessors and 8051 microcontroller.
2. Describe various addressing modes, assembler directives and assembly level instructions of 8051 micro controller.
3. Write assembly language programs for interfacing various I/O devices and memories with 8051 micro controller.
4. Describe architectures of various advanced processors.



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**(A30530) ARTIFICIAL INTELLIGENCE**  
**(Open Elective – III offered by CSE)**

**B.Tech EEE VIISem****LT P C**  
**3 0 0 3****UNIT -I****Problem Solving by Search-I:**

Introduction to AI, Intelligent Agents

**Problem Solving by Search –II:**

Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A\* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environment .

**UNIT –II****Problem Solving by Search-II and Propositional Logic****Adversarial Search:**

Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.

**Constraint Satisfaction Problems:**

Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

**Propositional Logic:**

Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic

**UNIT –III****Logic and Knowledge Representation****First-Order Logic:**

Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

**Inference in First-Order Logic:**

Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

**Knowledge Representation:**

Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

**UNIT –IV**

**Planning**

**Classical Planning:**

Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

**Planning and Acting in the Real World:**

Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning,

**UNIT –V**

**Uncertain knowledge and Learning**

**Uncertainty:**

Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use,

**Probabilistic Reasoning:**

Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient

Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and

First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

**Learning:**

Forms of Learning, Supervised Learning, Learning Decision Trees. Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming

**Text Books:**

1. Artificial Intelligence A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Pearson Education

**Reference Books:**

1. Artificial Intelligence, E.Rich and K.Knight, , 3rd Edition, TMH
2. Artificial Intelligence, Patrick Henny Winston, 3rd Edition, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

**Course Outcomes**

Students shall be able to

1. Formulate an efficient problem space for a problem expressed in natural language.
2. Select a search algorithm for a problem and estimate its time and space complexities.
3. Represent knowledge using the appropriate technique for a given problem.
4. Apply AI techniques to solve problems of game playing, and machine learning.
5. Explain various forms of learning techniques.

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**(A30539) ETHICAL HACKING**  
**(Open Elective – III offered by CSE)**

**B.Tech EEE VIISem**

**LT P C**  
**3 0 0 3**

**UNIT-I**

Introduction to Ethical Hacking, Fundamentals of Computer Networking, TCP/IP protocol stack, IP addressing and routing, TCP and UDP, IP Subnets, Routing protocols, IP Version 6. IP Spoofing port scanning, DNS Spoofing. Dos attacks – SYN attacks, Smurf attacks, UDP flooding, DDOS – Models. Firewalls – Packet filter firewalls, Packet Inspection firewalls – Application Proxy Firewalls. Batch file Programming.

**UNIT-II**

Hacking windows, Network hacking, Web hacking- Password hacking. A study on various attacks – Input validation attacks, Buffer overflow attacks, Privacy attacks, Vulnerability assessment: OpenVAS, Nessus, etc. Social Engineering attacks, Malware threats, penetration testing by creating backdoors.

**UNIT-III**

Introduction to cryptography, private-key encryption, public-key encryption, cryptographic hash functions, digital signature and certificate, applications. Fundamentals of Computer Fraud – Threat concepts – Framework for predicting inside attacks – Managing the threat – Strategic Planning Process

**UNIT-IV**

Steganography, biometric authentication, network-based attacks, DNS and Email security, Sniffing: Wireshark, ARP Poisoning, DNS Poisoning, Hacking Wireless networks, Denial of Service attacks, Architecture strategies for computer fraud prevention – Protection of Web sites – Intrusion detection system – NIDS, HIDS – Penetrating testing process.

**UNIT-V**

Elements of Hardware security: Side-Channel attacks, Physical inclinable functions, hardware Trojans, Hacking web applications: vulnerability assessment, SQL Injection, Cross-Site Scripting Penetration Testing Steps, Pen - Test Legal Framework,  
Automated Penetration Testing Tools, Pen -Test Deliverables

**Text Books:**

1. Kenneth C.Brancik —Insider Computer Fraud| Auerbach Publications Taylor &Francis Group–2008.
2. Ankit Fadia —Ethical Hacking| second edition Macmillan India Ltd, 2006
3. Data and Computer Communications -- W. Stallings.

**Reference Books:**

1. Hacking Exposed Web 2.0, by Rich Annings, Himanshu Dwivedi, Zane Lackey, TataMc Graw hill Edition
2. Ethical Hacking & Network Defense, Michael T. Simpson edition
3. Hacking Exposed Windows, Joel Scambray, cissp, Stuart McClure, Cissp, Third Edition, Tata McGraw hill edition
4. Hacking Exposed Window server 2003, Joel Scambray Stuart McClure, Tata Mc Graw hill Edition

**Course Outcomes**

Students shall be able to

1. Describe various types DoS attacks.
2. Explain Network, Web, Password Hacking
3. Describe cryptography techniques.
4. Explain Email-security, Sniffing, SQL injection
5. Perform Penetration Test.

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**(A30382) FUNDAMENTALS OF MECHANICAL  
ENGINEERING****(Open Elective – III offered by Mechanical)****B.Tech EEE VIII Sem****LT 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  $C_p$  and  $C_v$ , 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 – III offered by Mechanical)**

**B.Tech EEE VIISem**

**LT 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.

**(A30164) BASICS OF CIVIL ENGINEERING**  
**(Open Elective – III offered by Civil)**

**B.Tech EEE VIII Sem**

**LT 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; Intelligent buildings.

**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. Kandy, 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**

1. The students will be able to illustrate the fundamental aspects of Civil Engineering.
2. The students will be able to plan and set out a building.
3. Students will be able to explain the concepts of surveying for making horizontal and vertical measurements.
4. They will be able to illustrate the uses of various building materials and explain the method of construction of different components of a building.
5. Students will be able to discuss about various services in a building.

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**(A30165) SUSTAINABILITY CONCEPTS IN CIVIL  
ENGINEERING**  
**(Open Elective – III offered by Civil)**

**B.Tech EEE VIII Sem**

**LT 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 c o n c e p t s . 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 Publications Rating 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. Learn the sustainability concepts; understand the role and responsibility of engineers in sustainable development.
2. Quantify sustainability, and resource availability, Rationalize the sustainability based on scientific merits.
3. Understand and apply sustainability concepts in construction practices, designs, product developments and processes across various engineering disciplines.
4. Make a decision in applying green engineering concepts and become a lifelong advocate of sustainability in society.

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**(C30165)BASICS OF INSURANCE & TAXATION**  
**(Open Elective – III offered by MBA)**

**B.Tech EEE VIII Sem**

**LT P C**  
**3 0 0 3**

**(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-filing, 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. Shrikrishan Laxman Karve, 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.



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**(C30166) BUSINESS ETHICS & CORPORATE GOVERNANCE**  
**(Open Elective – III offered by MBA)****B.Tech EEE VIII Sem****LT P C**  
**3 0 0 3**

**(Students must read text book & References. Faculty are free to choose any other cases)**

**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 psychological , dimensional , Intellectual property in the cyberspace,Ethical dimenstions of cyber crimes-the psychology, 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.Praveen Parboteeach, 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.

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**(A30477) FUNDAMENTALS OF EMBEDDED SYSTEMS**  
**(Open Elective-IV offered by ECE)**

**B.Tech EEE VIII Sem**

**LT 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
- 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. Understand the basics of embedded systems and its types.
2. Study the 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.

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**(A30478)SENSORS & TRANSDUCERS**  
**(Open Elective-IV offered by ECE)**

**B.Tech EEE VIII Sem****LT 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. Understand the basic concepts of mechanical and electromechanical sensors, their electrical characteristics.
2. Understand/Analyze various capacitor sensors, ultrasonic sensors their electrical characteristics.
3. Analyze 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.

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**(A30538)DEEP LEARNING**  
**(Open Elective-IV offered by CSE)**

**B.Tech EEE VIII Sem****LT 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, Yoshua Bengio 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.

**(A30556) CYBER SECURITY**  
**(Open Elective-IV offered by CSE)**

**B.Tech EEE VIII Sem**

**LT P C**  
**3 0 0 3**

**UNIT-I**

**Introduction to Cybercrime:** Introduction, Cybercrime and Information security, who are cybercriminals, Classifications of Cybercrimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

**Cyber offenses:** How criminals Plan Them Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

**UNIT-II**

**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 an Measures in Mobile Computing Era, Laptops.

**UNIT-III**

Cybercrimes and Cyber security: the Legal Perspectives Introduction Cyber Crime and Legal Landscape around the world, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario In India, Digital signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment ,Cyber law, Technology and Students: Indian Scenario

**UNIT-IV**

Understanding Computer Forensics: 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, Chain of Custody concept, Network Forensics, Approaching a computer, Forensics Investigation, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing

## **UNIT-V**

**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

### **Text Books:**

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal
2. Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.
3. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J.David Irwin.CRC
4. Press T&F Group

### **Reference Books:**

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

### **Course Outcomes**

Students shall be able to

1. Explain cyber-crimes and how they are planned
2. Describe vulnerabilities of mobile and wireless devices
3. Illustrate the crimes in mobile and wireless devices
4. Be able to use cyber security, information assurance, and cyber/computer forensics software/tools.
5. Identify various crimes.

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**(A30358) INDUSTRIAL SAFETY ENGINEERING**  
**(Open Elective-IV offered by Mechanical)**

**B.Tech EEE VIII Sem****LT 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-IV offered by Mechanical)**

**B.Tech EEE VIII Sem****LT 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

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**(A30166) ENVIRONMENTAL PROTECTION AND  
MANAGEMENT**  
**(Open Elective-IV offered by Civil)**

**B.Tech EEE VIII Sem****L T P C****3 0 0 3****Course Objectives:**

1. 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 environmental management system standards.
2. Lead pollution prevention assessment team and implement waste minimization options.
3. Develop, Implement, maintain and Audit Environmental Management systems for Organizations.

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**(A30167) ALTERNATE BUILDING MATERIALS**  
**(Open Elective-IV offered by Civil)**

**B.Tech EEE VIII Sem****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 in manufacturing building materials
- Study the various masonry blocks, masonry mortar and structural behavior of masonry under compression.
- 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.Relevant IS Codes.

**Course Outcomes:** After studying this course, students will be able to:

1. Solve the problems of Environmental issues concerned to building materials and cost effective building technologies;
2. Select appropriate type of masonry unit and mortar for civil engineering constructions; also they are able to Design Structural Masonry Elements under Axial Compression.
3. 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.
4. Recommend various types of alternative building materials and technologies and design a energy efficient building by considering local climatic condition and building material.

**(C30167) MARKETING MANAGEMENT**  
**(Open Elective-IV offered by Civil)**

**B.Tech EEE VIII Sem**

**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.

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**(C30168) INTELLECTUAL PROPERTY RIGHTS**  
**(Open Elective-IV offered by MBA)**

**B.Tech EEE VIII Sem**

**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, Prabuddha Ganguli, Tata Mc Graw
3. 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.