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) Bachelorof Technology (B.Tech.) degree Programme, under Choice Based Credit System (CBCS), with effect from the Academic Year 2018 - 19 and onwards, in the following Branches of Engineering.

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

2.0 Admission Procedure

2.1. Admissionswill bedone asper the normsprescribedbythe Government of Telangana. The Governmentorders invogueshallprevail.

2.2. Thecandidateshouldhavepassedthequalifyingexaminat ionIntermediateorequivalentonthe dateofadmission.

2.3. Seatsineachprograminthecollegeareclassifiedintoategory–A(70%ofintake)andCategory-B(30%of intake)besidesLateral Entry. Category-Aseatswillbefilled by theConvener, TSEAMCETAdmissions.Category-Bseats will befilled bytheCollege as per the guidelinesof theCompetentAuthority.

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

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

3.0 B.Tech. Degree Course Structure

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

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

3.2.1 Semester Scheme:

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

3.2.2 Course Credits:

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

- One Credit - for One hour/ Week/ Semester for Theory/ Lecture (L)/Tutorial Courses; and,

- One Credit - for Two hours/ Week/ Semester for Laboratory/ Practical (P) Courses

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

3.2.3 Course Classification:

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

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

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

3.2.4 Course Nomenclature:

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

S. No.	*Broad Course*	*Course Group/ Category*	*Course Description*	*Suggested Breakup of*

	Classificati-on			***Credits by AICTE(160)***
1	**Foundation Courses (Fn C)**	**BSC – Basic Science Courses**	Includes - Mathematics, Physics and Chemistry Subjects	**25***
2		**ESC - Engineering Science Courses**	Includes fundamental engineering subjects	**24***
3		**HSMC – Humanities and Social Sciences including Management Courses**	Includes subjects related to Humanities, Social Sciences and Management	**12***
4	**Core Courses (Co C)**	**PCC– Professional Core Courses**	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engg.	**48***
5	**Elective Courses (Eℓ C)**	**PEC – Professional Elective Courses**	Includes Elective subjects related to the Parent Discipline/ Department/ Branch of Engg.	**18***
6		**OEC – Open Elective Courses**	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department/ Branch of Engg.	**18***
7	**Core Courses**	**Project**	B.Tech. Project or UG Project or UG Major Project	**15***
8		**Industrial Training/ Mini-Project**	Industrial Training/ Internship/ UG Mini-Project/ Mini-Project	
9		**Seminar**	Seminar/ Colloquium based on core contents related to Parent Discipline/	

			Department/ Branch of Engg.	
10		**Mandatory Courses (MC)**	Mandatory Courses (non-credit)	**Nil**
Total Credits for B. Tech. Programme				**160**

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

4.0 Course Work

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

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

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

5.0 Course Registration

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

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

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

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

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

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

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

5.8 The Course Options exercised through 'ON-LINE' Registration are final and CANNOT be changed; further, alternate choices will also not be considered. However, if the Course that has already been listed for Registration (by the Head of Department) in a Semester and could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice -

either for a new Course (subject to offering of such a Course), or for another existing Course (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

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

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

6.0 Courses to be offered

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

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

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

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

7.0 Attendance Requirements

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

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

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

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

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

8.0 Academic Requirements

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

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

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

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

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

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

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

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

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

8.6 A Student shall - register for all courses covering 160 credits as specified and listed (with the relevant Course

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

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

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

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

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

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

9.0 Evaluation - Distribution and Weightage of Marks

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

10. 0. Semester End Examination (SEE)

10.1. Theory Courses

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

Part-A: 20 Marks
There shall be 10 questions each carrying 2 Marks. (Two questions from each Unit)

Part-B: 50 Marks
There shall be 10 questions out of which 5 questions (Internal choice within a unit i.e. two questions from each unit out of which one question to be answered) are to be answered, each question carry 10 marks.

10.2. Laboratory Courses

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

10.3. Supplementary Examinations

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

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

11.0. Grading Procedure

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

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

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

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

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

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

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

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

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

$$\mathbf{SGPA} = \{\textstyle\sum_{i=1}^{N} C_i\, G_i\} \,/\, \{\textstyle\sum_{i=1}^{N} C_i\} \;\ldots\; \textbf{For each Semester},$$

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

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

$$\mathbf{CGPA} = \{\textstyle\sum_{j=1}^{M} C_j\, G_j\} \,/\, \{\textstyle\sum_{j=1}^{M} C_j\} \ldots \textbf{for all S Semesters registered}$$

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

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

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

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

12.0. Passing Standards:

12.1. A student shall be declared successful or 'passed' in a Semester, only when he gets a SGPA $\geq$ 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 …

% of Marks = (final CGPA – 0.5) x 10

14.0. Award of Degree

14.1 A Student who registers for all the specified Courses as listed in the Course Structure, satisfies all the Course

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

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

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

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

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

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

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

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

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

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

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

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

15.0. Withholding of Results

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

16.0 Transitory Regulations

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

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

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

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

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

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

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

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

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

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

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

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

16.2. **For Transferred Students**

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

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

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

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

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

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

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

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

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

17.0 Student Transfers

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

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

18.0 Scope

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

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

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

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

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

ACADEMICREGULATIONSFORB.TECH.(LATERALENTRYSCHEME)

(ApplicableforthestudentsadmittedintoIIyearB.Tech.(LateralEntryScheme)fromtheAcademicYear2019-20 and onwards)

1. **Eligibility foraward ofB. Tech.Degree(LES)**

1.1. TheLEScandidatesshallpursueacourseofstudyfor notless thanthreeacademicyearsandnotmore thansixacademicyears.

1.2. Thecandidateshallregisterfor122creditsandsecure122creditsfromIItoIVyearB.Tech. Program (LES)fortheawardof B.Tech.Degree. They are exempted from the courses of I year offered to regular entry students.

1.3. Thestudents,whofailtofulfilltherequirementfor the awardofthedegreein6consecutiveacademic yearsfromtheyearof admission,shallforfeittheirseats.

1.4. Theattendanceregulationsof B.Tech.(Regular)shallbeapplicabletoB.Tech. (LES).

2. **Promotion Rule**

AstudentshallbeeligibleforpromotioninB.Techprogramme,ifhe/she acquirestheminimumnumberof creditsasgivenbelow:

2.1. AstudentshallbepromotedfromIIYeartoIIIYearonlyifhe/shefulfillstheacademicrequirementsof24creditsoutof41credits (60%ofaveragecredits)up toIIyearIISemester,fromall theexaminations,whetheror notthecandidatetakestheexaminations.

2.2. AstudentshallbepromotedfromIIIyeartoIVyearonlyifhe/shefulfillstheacademicrequirementsof49creditsoutof 83credits (60%ofaveragecredits) up toIIIYearIISemesterfromall theexaminations,whetheror notthecandidatetakestheexaminations.

2.3. Astudentshallregisterandputupminimumattendanceinall122 creditsandearnall122creditstobeeligiblefor theaward of degree.

2.4. Studentswhofailtoearn122creditsasindicatedinthecoursestructurewithinsixacademicyearsfromtheyearoftheiradmissionshallforfeittheirseatinB.Tech.Courseandtheiradmissionstandscancelled.

3. **Award ofClass**

AlltheotherregulationsasapplicabletoB.Tech.4-yeardegreecourse(Regular)willholdgoodfor B.Tech.(LateralEntryScheme).

MALPRACTICE RULES

Disciplinary Action for Malpractices/Improper Conduct in Examinations

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

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	Expulsion from the examination hall and cancellation of performance in that subject and all the other

	or any part thereof inside or outside the examination hall.	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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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous)
DEPARTMENT OF EEE

INSTITUTE VISION

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

INSTITUTE MISSION

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

DEPARTMENT VISION

To produce globally competitive engineering graduates and become center of excellence through research in the areas of Electrical & Electronics Engineering.

DEPARTMENT MISSION

- To impart quality and contemporary education in the realm of Electrical & Electronics Engineering
- To pursue research and new technologies in Electrical & Electronics Engineering and related disciplines in order to serve the needs of the society

PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

1. Excel in their professional career and higher education in Electrical & Electronics Engineering and chosen fields.
2. Demonstrate leadership qualities, teamwork and professional ethics to serve the society.
3. Adapt to state of art technology through continuous learning in the areas of interest.

PROGRAM OUTCOMES (PO'S)

1. An ability to apply knowledge of mathematics, science, and engineering for solving complex engineering problems.
2. An ability to identify, formulate and analyze engineering problems to obtain appropriate solutions.
3. Ability to design solutions for complex engineering problems with appropriate consideration for the society.
4. Ability to use research-based knowledge and research methods including design of experiments to provide valid conclusions.
5. An ability to identify and solve engineering problems, using modern tools for complex design.
6. An ability to design a system within realistic constraints such as social, health and safety issues.
7. Ability to understand the impact of engineering solutions in a global, economic, environmental, and societal context with sustainability.
8. Commitment to professional ethics and responsibilities for engineering practice.
9. An ability to function on multidisciplinary teams.
10. An ability to communicate technical information effectively.
11. Ability to understand engineering and management principles and apply them to one's own work, as a member and leader in a team, to manage projects.
12. An ability to engage in lifelong learning.

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
Total:			**10**	**2**	**13**	**18.5**

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
Total:			**11**	**1**	**15**	**19.5**

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
Total			**18**	**1**	**8**	**22**

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
Total			**15**	**0**	**12**	**19**

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
PE	PEC	Professional Elective-I	3	0	0	3
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				
A30018		Essence of Indian Traditional Knowledge	2	0	0	0
Total			**19**	**1**	**6**	**21**
A30261	MC	Mini project-I	During summer vacation /Non Credit			
A30262		Internship-I				
A30560	MC	**Introduction to Artificial Intelligence**				

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
PE	PEC	Professional Elective-II	3	0	0	3
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
Total			**20**	**0**	**6**	**21**
A30556	**MC**	**Cyber Security**				

VII SEMESTER

Course Code	Category	Course	L	T	P	C
PE	PEC	Professional Elective-III	3	0	0	3
PE	PEC	Professional Elective-IV	3	0	0	3
PE	PEC	Professional Elective-V	3	0	0	3
OE-I	**OE-I**	**OPEN ELECTIVE-I**	3	0	0	3
OE-II	**OE-II**	**OPEN ELECTIVE-II**	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
	Total		**15**	**0**	**24**	**21**
A30264	MC	Mini project-II	During summer vacation /Non Credit			
A30265		Internship-II				

VIII SEMESTER

Course Code	Category	Course	L	T	P	C
PE	PEC	Professional Elective-VI	3	0	0	3
OE-III	**OE-III**	**OPEN ELECTIVE-III**	3	0	0	3
OE-IV	**OE-IV**	**OPEN ELECTIVE-IV**	3	0	0	3
A30266	PROJ	Technical Seminar-II	2	0	0	2
A30268	PROJ	Major Project Phase-II	0	0	14	7
	Total		**11**	**0**	**14**	**18**

Professional Electives			
Sl.No	**SubjectCode**	**Name of the Subject**	**Category**
1	A30247	Optimization Techniques	PEC-I
2	A30232	Electrical Instruments	
3	A30233	Electric Smart Grid Technologies	
4	A30234	Electrical Distribution Systems	PEC-II
5	A30235	Non-Conventional Energy Sources	
6	A30236	Digital Control Systems	
7	A30237	HVDC Transmission	PEC-III
8	A30238	Power System Operation & Control	
9	A30239	Switched Mode Power Supply	
10	A30240	High Voltage Engineering	PEC-IV
11	A30241	Power Quality	
12	A30242	Utilization of Electrical Energy	
13	A30243	Flexible ACTransmission Systemdevices	PEC-V
14	A30244	Reliability Engineering	
15	A30245	Advanced Electrical Drives	
16	A30246	Electrical Energy Conservation & Auditing	PEC-VI
17	A30231	AI Techniques in Electrical Engineering	
18	A30413	Digital Signal Processing	

OPEN ELECTIVES		
Sl. No	**SubjectCode**	**Name of the Subject**
1	A30554	Java Programming
2	A30531	Python Programming
3	A30555	Introduction to Database Management Systems
4	A30537	Data Analytics with R
5	A30557	Web Programming
6	A30542	Cloud Computing
7	A30538	Deep Learning
8	A30559	Introduction to Data Science
9	A30471	Principles of Electronic Communications
10	A30472	Basic Electronics Engineering
11	A30383	Fundamentals of Engineering Materials
12	A30377	Basics of Thermodynamics
13	A30258	Basics of Power Electronics & Drives
14	A30252	Power Generation Systems
15	A30160	Disaster Management and Mitigation
16	A30161	Remote Sensing and GIS
17	C30161	Logistics and Supply Chain Management
18	C30162	Knowledge Management
19	A30473	Image Processing
20	A30474	Digital Electronics
21	A30357	Fundamentals of Manufacturing Processes
22	A30379	Fundamentals of Automobile Engineering
23	A30259	Electrical & Hybrid Vehicles
24	A30260	Electrical Safety
25	A30162	Green Buildings
26	A30163	Air Pollution and Control
27	C30163	Management of Industrial Relations
28	C30164	Entrepreneurship

Sl. No	SubjectCode	Name of the Subject
29	A30475	Data Communications
30	A30476	Microcontrollers & Applications
31	A30382	Fundamentals of Mechanical Engineering
32	A30378	Waste to Energy
33	A30253	Fuel Cell Technology
34	A30255	Energy Efficiency in Electrical Utilities
35	A30164	Basic Civil Engineering
36	A30165	Sustainability Concepts in Civil Engineering
37	C30165	Basics of Insurance & Taxation
38	C30166	Business Ethics & Corporate Governance
39	A30477	Fundamentals of Embedded Systems
40	A30478	Sensors & Transducers
41	A30358	Industrial Safety Engineering
42	A30360	Work System Design
43	A30256	Energy Audit & Conservation
44	A30257	Nano Technology
45	A30166	Environmental Protection and Management
46	A30167	Alternate Building Materials
47	C30167	Marketing Management
48	C30168	Intellectual Property Rights

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

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

B.Tech (EEE): I Semester	**L**	**T**	**P**	**C**
	3	**1**	**0**	**4**

UNIT-I

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

UNIT-II

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

UNIT-III

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

REFERENCE BOOKS:

1. Advanced Engineering Mathematics(3rd edition) by R.K. Jain & S.R.K. Iyengar, Narosa Publishing House, Delhi.
2. Calculus and Analytic geometry, (9^{th}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^{th}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^{rd} 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 martices
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: Field intensity, Magnetic field induction, Magnetization, Magnetic Permeability & Susceptibility, origin of magnetic moment-Bohr Magneton,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.,1st Edition, 2012.
2. Engineering Physics by PK Palanisamy, SciTech Publications,3rd edition, 2015.

REFERENCES

1. Fundamentals of Physics by Halliday,R.Resnick and J.Walker,John Wiley and Sons,6th edition, 2001.
2. Introduction to Quantum PhysicsbyEisberg and Resnick, John Wiley & Sons, 2nd edition, 1985.
3. Quantum mechanics by D.J Griffiths, Cambridge University press, 2nd edition, 2017.

4. Principles of Lasers by O.Svelto, Plenum publishing Corporation, 4th edition, 1998.
5. Physics of Semiconductor devices by Simon.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. Understand the different semiconductor devices and circuits for optical communication
4. Interpret the basic properties of lasers and characteristics of optical fibers for modern communication.
5. Aquaire knowledge on properties of dieectric,,magnetic materials & illustrate the basic principles of superconductivity.

(A30501)PROGRAMMING FOR PROBLEM SOLVING

	L	T	P	C
B.Tech (EEE): I Semester	**3**	**0**	**0**	**3**

UNIT -I

Introductory Concepts: Introduction to Computers, Computer Characteristics, Modes of Operation, Types of Programming Languages.
Idea of Algorithm: Steps to solve logical and numerical problems.
Representation of Algorithm: Flowchart/ Pseudo code with examples.
Algorithms to programs: Source code, variables (with data types), variables and memory locations, Syntax and Logical Errors in compilation, object and executable code
Introduction to C: Some Simple C Programs, Desirable Program Characteristics.
C Fundamentals: The C Character Set, Identifiers and Keywords, Data Types, Constants Variables and Arrays Declarations, Expressions, Statements, Symbolic Constants.
Preparing and Running a Complete C Program: Planning a C Program, Writing a C Program, Entering the Program into the Computer, Compiling and Executing the Program, Error Diagnostics, Debugging Techniques.
Operators and Expressions: Unary Operators, Arithmetic Operators, Relational and Logical Operators, Bitwise Operators, Conditional Operator, Assignment Operators, Special Operators, Precedence & Associativity of Operators , Evaluation of Expressions.
Data Input and Output: Preliminaries, Single Character Input- The getchar Function, Single Character Output- The putchar Function, Entering Input Data- The scanf Function, More About the scanf Function, Writing Output Data- The printf Function, More About the printf Function, The gets and puts Functions.

UNIT -II

Control Statements: Preliminaries, Branching: The if-else Statements, Looping: The while Statement, the do while Statement, the for Statement, Nested Control Structures, the switch Statement, the break Statement, the continue Statement, the goto Statement.
Arrays: Defining an Array, Processing an Array, Multidimensional Arrays.

UNIT -III

Functions: A Brief Overview, Defining a Function, Accessing a Function, Function Prototypes, Passing Arguments to a Function, Recursion, Passing Arrays to Functions. **Program Structure:** Storage Classes- Automatic Variables, External Variables, Static Variables and Register Variables, Multi files Programs, More about Library Functions. **Strings:** String Handling Functions, Sample C Programs without using library functions.

UNIT -IV

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

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

UNIT -V

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

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

Text Books

1. Byron Gottfried, Schaum's Outline series, "Programming with C", McGraw-Hill.

2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning,
(3rd Edition)

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall
of India.

2. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).

3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
4. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.

Course Outcomes :By the end of the course

The student shall be able

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

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

(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 physics , Published by CMR College of Engineering & Technology

COURSE OUTCOMES

On completion of the course students will be able to

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

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

B. Tech (EEE) I Semester	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

Lab 1: Familiarization with programming environment

i. Write a simple C program to display "Hello, World!" on the screen

ii Identify various parts in C program.

iii. Compile & Run the C- Program using various Compilers.

iv. Identify Syntax Errors and correct them.

Lab 2: Simple computational problems using arithmetic expressions

i.Write a C program to find the roots of a quadraticequation.

ii.Write a C program to convert centigrade toFahrenheit.

Lab 3:

i.Write a C program to find maximum of given threenumbers.

ii.Write a C program to find the factorial of a positiveinteger.

Lab 4:

i. Write a C program to determine if the given number is a prime number ornot.

ii. 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 n^{th}term.

Lab 5:

i. Write a C program to generate all the prime numbers between 1 and n, where n is avalue supplied by the user using Sieve of Eratosthenesalgorithm.

ii. Write a C program to convert a positive integer to a roman numeral. Ex. 11 isconvertedtoXI.

Lab 6:

i.Write a C program to print the Pascal trianglespyramid

ii.Write a C program to calculate the followingseries

a) Sin(x) b) Cos(x) c)log(x)

Lab 7:

i. Write a C program that reads two matrices and uses functions toperform thefollowing:

a) Addition of two matrices b) Multiplication of two matrices

c) Transpose of aMatrix.

ii. Define four pointer variables, one each of type char, short, int, float. Fill these pointers by allocate memory of required size by calling malloc () function. Read data from the user and fill in the memory (allocated using malloc ()). Finally display the data

Lab 8:

i. Write a C program to read N students data (Rollo, Name, Marks1, Marks2, Marks3)and find the topper (Use array of structures and implement usingfunctions).

Lab 9:

i. 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.

ii. 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 binarynumber.

Lab 10:

i. Write a C program to display the contents of a file to standard outputdevice.

ii. Write a C program which copies one file to another, replacing all lowercasecharacters with their uppercaseequivalents

Lab 11:

i. Write a C program that uses non-recursive functions to count the number ofpalindromes in a givenstring.

ii. Write a C program to replace a substring with another in a given line oftext.

Lab 12:

i. Write C programs for implementing the followingmethods
   a. a) BubbleSortb) Selection Sort c) BinarySearch

Additional Programs:

1. Write a C program that implements the Insertion sort method to sort a given list of integers in ascendingorder.
2. Write a C program that uses functions to perform the followingoperations:
   i. To insert a sub-string into a given main string from a givenposition.
   ii. To delete n characters from a given position in a givenstring.
3. Write a C program to compare two files, printing the first line where theydiffer.
4. Write a C program to reverse the first n characters in a file. The file name and nare specified on the command line. Use fseek() function
5. Write a C program to merge two files into a third file (i.e., the contents of the firstfile 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, CengageLearning, (3rdEdition)
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 (16thImpression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, PearsonEducation.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4thEdition

Course outcomes

The student shall be able

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

(A30505) BASIC INTERNET OF THINGS LAB

B.Tech (EEE): I Semester

L	T	P	C
0	0	2	1

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

- 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.

Experiment 1: Create Hello World application with Android.

Week 8

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

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

Week 9

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

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

Week 10

- Explain what activity, intent and its functions .

Experiment 1: Create an application with Android intent.

Week 11

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

- On Click
- On Key Down
- On Focus changed

Week 12

- Explain about Toast, Create Application with User defined Toast Notifications.

Experiment 1: Create login page by using login activity.

Reference Books:

1. Arshdeep Bahga,Vijay Madisetti, 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

L	T	P	C
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 forPatent filing and Startups, poster presentation.

References:

1. Social Entrepreneurship for the 21st Century: Innovation Across the Non Profit, Private and Public Sectors; Georgia Levenson Keohane; Tata McGraw Hill
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, 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. Identify community issues through community Intearction
2. Illustrate the factors affecting social innovation in various sectors
3. Analyze the stages of social innovation for a community problem.
4. Adopt the ethical values in implementing the Social innovation.
5. Describe the process of property rights and patent filing.

(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 Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

COURSE OUTCOME:

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

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

(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, (36thEdition), B.S. Grewal, Khanna Publishers, 2010
2. Advanced Engineering Mathematics, (9thEdition), 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(2ndEdi) by George F Simmons, Tata Mc. graw Hill Publishing Co Ltd.
3. Advanced Engineering Mathematics(8thEdition) by Kreyszig, John Wiley & Sons Publishers
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry(9thEdition),Pearson, Reprint, 2002
5. Mathematics for Engineering and Scientists(6th 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, Nernst equation- derivation and applications, Types of electrodes- Quinhydrone electrode, Calomel electrode and Glass electrode. Electro chemical series and its applications. Concept of concentration cells, Electrolytic concentration cell and numerical problems, Batteries- primary (Lithium cell), secondary (Lead acid storage battery and Lithium ion battery) and Fuel cells (H_2-$O_2$and methanol-oxygen).

Corrosion:

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

UNIT –III

Spectroscopic Techniques and Applications:

Principles of spectroscopy and selection rules, Applications of UV-Visible spectroscopy, Vibrational and rotational spectroscopy (IRspectroscopy)-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 $KMnO_4$ and chromic acid, Reduction reactions-reduction of carbonyl compounds using $LiAlH_4$, $NaBH_4$, Synthesis of a commonly used drug molecules (Paracetamol and Ibuprofen).

Text Books:

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

Reference Books:

1. University chemistry, by B. H. Mahan, Narosa Publication.1998.
2. Chemistry: Principles and Applications, by M. J. Sienko and R.A. Plane, McGraw-Hill, 3rd edition, 1980.
3. Fundamentals of Molecular Spectroscopy, by C. N. Banwell, McGraw-Hill, 3rdrevised edition, 1983.
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S.Krishnan.
5. Physical Chemistry, by P. W. Atkins, W.H. Freeman and Company, 5th Edition, 1994.
6. “Text Book of Engineering Chemistry”, B.Rama Devi, Ch. VenkataRamana Reddy and PrasanthRath, Cengage Learning 2017.
7. “Organic Chemistry”, Morison and Boyd, Pearson publications, 7th Edition 2011.
8. Organic Chemistry: Structure and Function by K.P.C.Volhardt and N.E.Schore,5thEdition http://bcs.whfreeman.com/vollhardtschore5e/default.asp

COURSE OUTCOMES:

After completion of the course students will be able to

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

(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

6. Use data structure concepts for realistic problems.
7. Identify appropriate data structure for solving computing problems in respective language.
8. Develop algorithms, operations on queues, stacks and Linked Lists.
9. Demonstrate the representation and traversal techniques of graphs and their applications
10. Implement basic operations on binary trees.

(A30002) ENGLISH LANGUAGECOMMUNICATION SKILLS LAB

B.Tech (EEE): II Semester

L	T	P	C
0	**0**	**3**	**1.5**

shall have **two** parts

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

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

EXERCISE – I

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

EXERCISE – II

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

EXERCISE – III

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

EXERCISE – IV

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

EXERCISE – V

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

LEARNING OUTCOMES: By the end of the course students will develope:

COURSE OUTCOMES:

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

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

(A30012)ENGINEERING CHEMISTRY LAB

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 week acid vs a week base.
6. Potentiometric Titration of a strong acid vs a strong base.
7. Potentiometric Titration of week acid vs a week base.
8. Preparation of Paracetmol and Asprin.
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.

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.

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

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

B. Tech (EEE) II Semester

L	T	P	C
0	0	3	1.5

Lab 1: Write a C program to perform the following operations on the givenarray

(i) Insert element in specific position in toarray
(ii) Delete random element fromarray
(iii) Reverse the arrayelements

Lab 2: A) Write a C program to implement Single linkedlist
i) Insertion ii)Deletion iii)Display
B) Write a C program to implement Circular linkedlist
i) Insertion ii) Deletion. iii)Display

Lab 3: A) Write a C program to implement Doubly linkedlist
i) Insertion ii) Deletion. iii)Display
B) Write C programs to implement Stack ADTusing
i)Array ii) LinkedList

Lab 4:

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

Lab 5: Write C programs to implement Queue ADT using
i) Array ii) Linked List

Lab 6: Write a C program to implement Binary search tree
i) Insertionii) deletioniii) Traversals

Lab 7:

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

Lab 8:

(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:
Write a C program for implementing Graph traversal
i) DFS ii) BFS

Lab 10:
A) Write a C program to implement different hash methods

B) Write a C program to implement the following collisionresolving
i) Quadratic probing. ii) Linear Probing

Lab 11:
Write C programs for implementing the following Sorting methods and display the important steps.
i) Quick Sort ii) Heap sort

Lab 12:
Write a C program for implementing pattern matching algorithms
i) Knuth-Morris-Pratt ii) Brute Force

Additional
1. Implement the priority queue using Heap
2. Write a C Program to Implement Merge sort
3. Write a C program to implement AVL tree
   i) Creation ii) Deletion iii) Traversals
4. Write a function to reverse the nodes of a linked list
5. Write a C program to implement 2-3-4 tree operations
6. Write a C program to implement B tree operations
7. 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 have the

11. Ability to design and model different prototypes in the carpentry trade such as Cross lap joint, Dove tail joint. and various basic prototypes in the trade of fitting such as Straight fit, V- fit etc.
12. Align and assemble different components to create a product by fitting operations.Ability to make various basic prototypes in the trade of Tin smithy such as rectangular tray, and funnel
13. Ability to perform various basic House Wiring techniques such as connecting one lamp with two switch, ceiling fan etc.
14. Ability to design and model various basic prototypes in the trade of Welding such as Lap joint, Butt joint etc

15. Ability to design and model various basic prototypes in the trade of blacksmithy, foundry and plumbing.

(A30019) ENGINEERING EXPLORATION & PRACTICE
(Common to all branches)

B.Tech (EEE): II Semester

L	T	P	C
0	0	3	1.5

Module 1

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

Module 2

Engineering Design: Engineering Design Process, Multidisciplinary facet of design, Importance of analysis in engineering design, general analysis procedure, Pair wise comparison chart, Introduction to mechatronics system, generation of multiple 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

<u>Module 5</u>

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

(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 Differentiationof 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^{th} 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^{th} Edition), S.S. Sastry, PHI, 2005.
2. Complex Variables and Applications (7^{th}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^{th}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^{th} 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^{rd} 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. Kirchhoff‘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�छs laws
2. Explain the principle of AC fundamentals, series parallel circuits, locus diagram and resonance.
3. Explain basic principle of magnetic circuits & applications.
4. Analyze networks adopting network topology and concept of duality and dual networks.
5. Identify when & how to use network reduction & theorem with DC and AC excitations.

(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, div (D)= ρv 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, div(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, Curl (H)=Jc, 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. Apply the vector algebrs for understandin different coordinate systems
2. Analyze various Laws related to electrostatic field
3. Apply current density, continuity equation to evaluate properties of conductor, dielectrics, and capacitance.
4. Evaluate static magnetic fields using different laws and Explore the forces & torques exerted by magnetic field on various current distributions using laplace domain

5. Establish relationship between time variant & invariant electric & magnetic fields using Faradays Laws, Lenz's Laws & Maxwell's equations

(A30401) ELECTRONIC DEVICES & CIRCUITS

	L	T	P	C
B. Tech. (EEE) III-Semester	**3**	**0**	**0**	**3**

Unit-I: P-N Junction Diode

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

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

Unit- II: Rectifiers and Filters

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

Unit –III: Bipolar Junction Transistor and UJT

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

Unit- IV: Transistor Biasing and Stabilization:

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

Unit- V: Field Effect Transistor and FET Amplifiers

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

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

Text Books

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

Reference Books

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

Course Outcomes

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

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

(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 vaccum pressure-Measurement of pressure- Piezometer, U-Tube and Differential Manometers.

Unit II

Fluid kinematics: Stream line, path line and steak line and stream line, classification of flows steady &un steady, 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 & Bernouli‘s equations for flow along a stream line, moment equation and its applications on force on pipe bend. Measurement of flow: pitot tube, venture 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 closed conduit flow.
4. To select and analyze an appropriate turbine with reference to given situation in power plants.
5.To estimate performance parameters of a given Centrifugal and Reciprocatingpump.

(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.
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): 0-20µ A, 0-50 µA, 0-100 µA, 0-200 µA, 0 – 10mA
8. Voltmeters (Analog or Digital): 0-50V, 0-100V, 0-250V
9. Electronic Components: Resistors, Capacitors, BJTs, LCDs, SCRs, UJTs, FETs, LEDs, MOSFETs, Diodes (Ge & Si type), transistors (NPN & PNP type)

Course Outcomes:

On Completion of the course; students will be able to

Analyze the characteristics of different diodes and its applications.

1. Analyze the characteristics of different diodes and its applications.

Design various rectifier circuits with and without filters

2. Design various rectifier circuits with and without filters
3. Distinguish the characteristics of BJT, FET and UJT.
4. Design and analysis of various biasing circuits
5. Analyze various FET amplifier ciruits.

(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. Understand the performance of hydraulic machines through experimentation.
2. Find the coefficient of discharge of Venturi meter and Orifice meter through experimentation.
3. Determine the Major losses and Minor losses in fluid flow due to pipe friction through experimentation..
4. Understand and prove the principle of Bernoulli’s theorem through experimentation. Determine performance characteristics of popular turbines and pumps.
5. Design various components of pumps and turbines and study their characteristics.

(A30016)GENDER SENSITIZATION

B.Tech (EEE) III-Semester

L	T	P	C
0	0	2	0

UNIT-I:

Understanding Gender

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

UNIT-II:

Gender and Biology

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

UNIT-III:

Gender and Labour

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

UNIT-IV:

Issues of Violence

Lesson 6 – Sexual Harassment: Say No!
Lesson 8 – Domestic Violence: Speaking Out
Lesson 11 – Thinking about Sexual Violence

UNIT-V:

Gender Studies

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

Learning Outcomes

On Completion of the course, students will be able to

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

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

(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-φ 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 tets- predetermination of performance, Methods of starting and speed control for induction motors. Generator peration. Self-excitation. Doubly-Fed Induction Machines.

Unit IV: Single- φ 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 Shyammohan 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 Publicaitons.
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. Tech. (EEE) IV-Semester	L	T	P	C
	3	0	0	3

UNIT I: Number System and Boolean Algebra and Switching Functions

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

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

UNIT-II: Combinational Circuit Design

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

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

UNIT-III: Sequential Machines Fundamentals

Introduction, comparision ofCombinational 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 Circuits , Design Aspects, State Reduction, Realization using Flip-Flops.

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

UNIT-V: FSM and ASM Charts

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

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

Text Books

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

Reference Books

1 Introduction to Switching Theory and Logic Design - Fredriac J. Hill, Gerald R. Peterson, 3rd ED, John Wiley & Sons Inc
2 Digital Fundamentals – A Systems approach-Thomas L. Floyd, Pearson, 2013.
3 Digital Logic Design- Ye Brian and Holdsworth, Clive Woods, Elsevier.
4 Digital Logic Applications and Design - John M. Yarbrough, Thomson Publications, 2006.
5 Digital Logic and State Machine Design – David J. Comer, 3rd 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 simply the Boolean Functions.
3 Design simple Combinational Circuits.
4 Design simple Sequential Circuits.
5 Distinguish the Finite State Machines and Algorithmic State Machines Charts.

(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

1. Explain the process of emf induced in DC generator**.**
2. Analyze the characteristics of different types of DC generators by performing load test.
3. Evaluate performance of DC machines through different tests.
4. Determine the efficiency of DC M/G by conducting Hopkinson‘s test.
5. Draw the performance curves of a different DC motors by brake tests.

(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)

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

(A30015) SOFT SKILLS & PROFESSIONAL ETHICS

B.Tech (EEE) IV-Semester	**L**	**T**	**P**	**C**
	0	**0**	**2**	**0**

UNIT-I:

Business Communication Skills:

English Language Enhancement the Art of Communication.

UNIT-II:

Intrapersonal & Interpersonal Relationship Skills:

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

UNIT-III:

Campus to Company:

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

UNIT-IV:

Group Discussions, Interviews and Presentations:

- Group Discussions
- Interviews
- Presentations

UNIT-V:

Entrepreneurial Skills Development:

- Goal Setting
- Entrepreneurial Skills – Awareness and Development

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

1. Express themselves with proper pronunciations and sentence construction
2. Demonstrate a strong teamwork and be a team player
3. Develop a strong personal etiquette
4. Demonstrate good leadership qualities
5. Recognize and identify basic English grammar

REFERENCES

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

(A30209)CONTROL SYSTEMS

B.Tech EEE V Sem

L T P C
3 00 3

Course objectives:

1. To understand the different ways of system representations such as Transfer functionrepresentation and state space representations and to assess the system dynamicresponse
2. To assess the system performance using time domain analysis and methods forimproving it
3. To assess the system performance using frequency domain analysis and techniquesfor 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 andtheir differences- Different examples of control systems- Classification of control systems,Feed-Back Characteristics, Effects of feedback. Mathematical models – Differentialequations - Impulse Response and transfer functions - Translational and Rotationalmechanical systems.

Transfer Function Representation: Transfer Function of DC Servo motor - AC Servomotor- Synchro transmitter and Receiver, Block diagram representation of systemsconsidering electrical systems as examples - Block diagram algebra – Representation bySignal 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 ordersystems - Time domain specifications – Steady state response - Steady state errors and errorconstants – Effects of proportional derivative, proportional integral systems.

UNIT – III: STABILITY ANALYSIS

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

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

Frequency Response Analysis: Introduction, Frequency domain specifications-Bodediagrams-Determination of Frequency domain specifications and transfer function from theBode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

UNIT - IV: STABILITY ANALYSIS IN FREQUENCY DOMAIN:
Polar Plots, Nyquist Plots and applications ofNyquist criterion to find the stability - Effects of adding poles and zeros to G(s)H(s) on theshape 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 statemodel, derivation of state models from block diagrams, Diagonalization- Solving the Timeinvariant 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, 3rd Edition, 1998.
2. “NISE”, “Control Systems Engineering”, John wiley, 6th Edition, 2011.
3. “Katsuhiko Ogata”, “Modern Control Engineering”, Prentice Hall of India Pvt. Ltd.,3rd edition, 1998.

Course Outcomes:
After successful completion of this course, the studentscan be 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. Determine the stability of a linear control system. Design classical controllers for given system response
5. 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 Objectives:

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

UNIT-I: POWER SWITCHING DEVICES

Concept of power electronics, scope and applications, types of power converters; Power semiconductorswitches 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-phasehalf-controlled converter with RL and RLE load, Principles of three-phase fully-controlled converteroperation with RLE load, Effect of load and source inductances, General idea of gating circuits, Singlephase and Three phase dual converters

UNIT-III: DC-DC CONVERTERS (CHOPPER)

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

After successful completion of this course, the studentscan be able to

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

(A30211)POWER SYSTEMS-II

B.Tech EEE V Sem **L T P C**
3 00 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 powertransmission.

UNIT I: TRANSMISSION LINE PARAMETERS

Types of conductors - calculation of resistance for solidconductors - Calculation of inductance for single phase and three phase, single and doublecircuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductorconfiguration 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 anddouble 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-Pie and A, B, C, D Constants for symmetrical & AsymmetricalNetworks, 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 andVelocity of Propagation of Waves - Representation of Long

Lines - Equivalent-T andEquivalent Pie network models (numerical problems).

UNIT III: POWER SYSTEM TRANSIENTS

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

VARIOUS FACTORS GOVERNING THE PERFORMANCE OF TRANSMISSION LINE:

Skin and Proximityeffects - Description and effect on Resistance of Solid Conductors - Ferranti effect – ChargingCurrent - Effect on Regulation of the Transmission Line.Corona - Description of the phenomenon, factors affecting corona, critical voltages andpower loss, Radio Interference.

UNIT-IV: OVERHEAD LINE INSULATORS

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

SAG AND TENSION CALCULATIONS: Sag and Tension Calculations with equal and unequalheights 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) LimitedPublishers, 1998.
2. "Grainger and Stevenson", "Power Systems Analysis", Mc Graw Hill, 1st Edition2003.

3. "M. L. Soni, P. V. Gupta, U.S. Bhatnagar and A. Chakrabarthy", Power SystemEngineering, DhanpatRai & 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 successful completion of this course, the studentscan be able to

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. Describe the characteristics and function of overhead line insulators and examine the sag and tension calculations.
5. Elucidate the construction and types of 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 arcinterruption, Recovery, Restriking Voltage and Recovery voltages.- Restriking Phenomenon,Average and Maximum RRRV, Numerical Problems - Current Chopping and ResistanceSwitching - 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 Attractedarmature, 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, DifferentialRelays and Percentage Differential Relays.Universal torque equation, Distance relays: Impedance, Reactance, and Mho and Off-SetMho relays, Characteristics of Distance Relays and Comparison. Static Relays: Static Relaysverses Electromagnetic Relays.microprocessor based protective relays.

MICROPROCESSOR BASED RELAYS: Advantages, over current relays, directional relays, distancerelays

UNIT – III: PROTECTION OF POWER EQUIPMENT

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

on Designof CT s Ratio, Buchholtz relay Protection.Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protectionusing 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 UngroundedNeutral 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. “BadriRam , D. N Viswakarma”, “Power System Protection and Switchgear”, TMHPublications, 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
   4. 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 AgeInternational

Course Outcomes:

After successful completion of this course, the studentscan be able to

1. Illustrate the constructional features, types and operation of various circuit breakers
2. Explain the types and choice of Relays for appropriate protection of power system equipment.
3. Identify various Faults in electrical machines and their protection.
4. Illustrate the importance of Neutral Grounding, Effects of Ungrounded Neutral grounding on system performance, methods and Practices.
5. Interpret the existing transmission voltage levels and various means to protect the system against over voltages.

(A30213)ELECTRICAL MEASUREMENTS

B.Tech EEE V Sem **L T P C**
3 00 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

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 successful completion of this course, the studentscan be able to

1. Classify various types of potentiometers
2. Compare different types of measuring instruments, their construction, operation andcharacteristics
3. Evaluate the values of Resistance, Inductance and Capacitance using various bridges
4. Apply the knowledge of magnetic measurements and to use them effectively.
5. 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, transportationproblem, 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 variableOptimization 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 andsteepest 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 theprinciple 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, 4thedition, 2009.
2. 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 inoperations 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 successful completion of this course, the studentscan be able to
1. Explain the need of optimization of engineering systems

2. Apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
3. Apply unconstrained optimization technique using various methods
4. Discuss about the construction and classification of constrained non-linear programming
5. Apply the conceptual things of dynamic programming to real world problems and applications

(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 successful completion of this course, the studentscan be able to

1. Explain different types of measuring instruments, their construction, operation andcharacteristics
2. Illustrate various types of instrument transformers
3. Describe the measurement of active and reactive powers in balanced and unbalanced systems
4. Explain the different techniques involved in energy measurement
5. Make use of the characteristics of transducers for various applications

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

B.Tech EEE V Sem **L T P C**
3 00 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).
Power Control of Smart 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:

After successful completion of this course, the studentscan be able to

1. Classify traditional power grid and smart grid
2. Explain the architecture of smart grid design
3. Demonstrate the various methods of distributed generation technologies.
4. Analyze the tools for smart grid design
5. Illustrate the power control of smart grid system

(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 Xd and Xq 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.

Course Outcomes:

After successful completion of this course, the students can be able to

1. Analyze the performance of transformers by conducting different tests
2. Identify the performance of a 3-Ø & 1-Ø induction motor using various methods
3. Apply different methods for finding regulation of 3-Ø alternator.
4. Analyse various curves of synchronous motor.
5. Determine Xd & Xq of a salient pole synchronous machine

(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 Boolean expressions and application of speed control of motor.
4. Effect of P, PD, PI, PID Controller on a second order systems
5. Temperature controller using PID
6. Characteristics of Synchros

Reference Books

1. Simulation of Electrical and electronics Circuits using PSPICE – by M.H.Rashid, M/s PHI Publications.
2. PSPICE A/D user‘s manual – Microsim, USA.
3. PSPICE reference guide – Microsim, USA.
4. MATLAB and its Tool Books user‘s manual and – Mathworks, USA.

Course Outcomes:

After successful completion of this course, the studentscan be able to

1. Analyze the time response of second order system and effect of P, PD,PI, PID controller on a second order system.
2. Build the transfer function of DC motor and DC generator.
3. Analyze the effect of feedback on DC Servo motor, characteristics of AC servo motor, synchros and magnetic amplifier.
4. Construct the PSPICE simulation circuit of Op-Amp based integrator and differentiator circuits
5. Make use of MATLAB software for the stste space model for classical transfer function

(A30017)INDIAN CONSTITUTION

L	T	P	C
2	0	0	0

B. Tech (EEE) V Sem

UNIT-I

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

UNIT-II

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

State Government and its Administration Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions

UNIT-III

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

B: Pachayati raj: Introduction, PRI: ZilaPachayat, Elected officials and their roles, CEO ZilaPachayat: Position and role, Block level:

Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT-
IV

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

UNIT-
V

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

Reference Books:

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

E-Resources:

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

Course Outcomes:

After successful completion of this course, the students can be able to

1. Know the sources, features and principles of Indian Constitution.
2. Learn about Union Government, State government and itsadministration.
3. Get acquainted with Local administration and Pachayati Raj.
4. Be aware of basic concepts and developments of HumanRights.
5. Gain knowledge on roles and functioning of ElectionCommission.

(A30018)ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

L	T	P	C
2	0	0	0

B.Tech (EEE) V Sem

UNIT I:

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

UNIT II:

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

UNIT III: Legal frame workand TK:

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

UNIT IV:

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

UNIT V:

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

Reference Books:

1. Traditional Knowledge System in India, by AmitJha,2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan2012.
3. Traditional Knowledge System in India 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 successful completion of this course, the students can be able to

1. Understand the concept of Traditional knowledge and its importance.

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

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

B.Tech EEE VSem

L	T	P	C
3	0	0	0

Unit-I

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

Unit-II

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

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

Unit-III

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

Unit-IV

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

Unit-V

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

TEXT BOOK:

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

REFERENCE BOOKS:

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

Course Outcomes

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

1. Build intelligent agents for search and games
2. Solve AI problems through programming with Python
3. Learning optimization and inference algorithms for model learning
4. Design and develop programs for an agent to learn and act in a structured environment.

END

(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, 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. Introduction to Markets, Demand-Supply Schedule for Equilibrium Price, Nature & Types of Competition.

UNIT – V: INTRODUCTION TO FINANCIAL STATEMENT ANALYSIS:

Types & Objectives of Business Enterprises, Conventional & Non-Conventional Sources of Financing Business Enterprise. Identification of Financial Statement Formats-Manufacturing A/c, Trading A/c, Profit & Loss A/c, Balance Sheet. Techniques of Analyzing Financial Statements: Analysis & Interpretation through Liquidity, Leverage, Coverage, Activity, Turnover, Profitability Ratios-Simple Problems on Liquidity, Leverage and Activity Ratios

Text Books:

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

Reference Books:

1. Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2005
2. Koontz &Weihrich: Essentials of Management, 6/e, TMH, 2005 Thomas N.Duening& John
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 00 3

Unit- I: 8086 ARCHITECTURE

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

Unit- II: INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING OF 8086

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

Unit- III: I/O INTERFACE

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

INTERFACING WITH ADVANCED DEVICES: Memory interfacing to 8086, Interrupt Structure of 8086, Vector interrupt table, Interrupt service routine.

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

Unit – IV: INTRODUCTION TO MICROCONTROLLERS

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

Unit – V: 8051 REAL TIME CONTROL

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

TEXT BOOKS:

1. D.V. Hall, Micro Processors and Interfacing, TMGH, 2nd edition 2006.

2. Kenneth.J.Ayala,The 8051 Microcontroller, 3rd Ed, Cengage Learning.
3. The 8051 microcontroller and Embedded Systems, Muhammad Ali Mazidi and Janice GillispieMazidi, Second Edition, Pearson Education India

REFERENCE BOOKS:

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

Course Outcomes

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

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

(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 connectedto d.c separately excited and d.c series motors – continuous current operation – output voltage and currentwaveforms – Speed and Torque expressions – Speed – Torque Characteristics- Problems on Converter fedd.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 threephase 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 quadrantchopper fed dc separately excited and series motors – Continuous current operation – Output voltage andcurrent wave forms – Speed and torque expressions – speed-torque characteristics – Problems on Chopperfed 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 andcurrent 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 ofinduction 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 synchronousmotors by VSI, CSI and cyclo converters. Load commutated CSI fed Synchronous Motor – Operation – Waveforms – speed torque characteristics – Applications – Advantages and Numerical Problems – ClosedLoop 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 successful completion of this course, the studentscan be able to

1. Modulate the speed of various DC Motors using single and three phaserectifiers.
2. Elucidate multi quadrant operation of a DC drive.
3. Describe the Chopper fed DC drive and analyze the performance.
4. Control the speed of Induction Motor by using various methods.
5. Explain the operation, characteristics of closedloop operation of self & separately controlled synchronous Motors byCSI & VSI Cycloconverters.

(A30234)ELECTRICAL DISTRIBUTION SYSTEMS
PROFESSIONAL ELECTIVE-II

B.Tech EEE VI Sem **L T P C**
3 00 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 circuitconstants (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. Benefitsderived through optimal location of substations. Optimal location of Substations (Perpendicular bisectorrule and X, Y co-ordinate method).
System Analysis: Voltage drop and power-loss calculations: Derivation for voltage drop and power lossin lines, manual methods of solution for radial networks, three phase balanced primary lines, analysis ofnon-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-linesectionalizes, and circuit breakers.

COORDINATION:

Coordination of Protective Devices: Objectives of protection co-ordination, general coordination
procedure, Types of protection coordination: Fuse to Fuse, Auto-Recloser to Fuse, Circuit breaker toFuse, 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 seriescapacitors, effect of shunt capacitors (Fixed and switched), effect of series capacitors, difference betweenshunt and series capacitors, Calculation of Power factor correction, capacitor allocation – Economicjustification 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. TuranGonen, Electric Power Distribution system Engineering, CRC Press, 3rd Edition 2014.
2. V. Kamaraju, Electrical Power Distribution Systems, Tata Mc Graw Hill Publishing Company, 2ndedition, 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 successful completion of this course, the studentscan be 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. Illustrate the power factor improvement methodologies
5. Demonstrate the importance of voltage control

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

B.Tech EEE VI Sem **L T P C**
3 00 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 titled 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:

After successful completion of this course, the studentscan be able to

1. Illustrate solar radiation data and classify solar thermal collectors with their applications.
2. Explain wind energy conversion systems.
3. Discuss about the bio energy conversion systems
4. Explain basic principle and working of tidal, OTEC and geothermal systems.
5. Demonstrate direct energy conversionsystems

(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 andobservability
- To study the estimation of stability in different domains
- To understand the design of discrete time control systems, compensators, state feedbackcontrollers, state observers through various transformations

UNIT-I: DISCRETE REPRESENTATION OF CONTINUOUS SYSTEMS

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

UNIT-II: DISCRETE SYSTEM ANALYSIS

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

STABILITY OF DISCRETE TIME SYSTEM

Stability analysis by Jury test. Stability analysis using bilinear transformation. Design of digital controlsystem 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 pointtracker. 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 feedbackcontroller 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:

After successful completion of this course, the studentscan be able to

1. Explain discrete representation of continuous systems.
2. Analyze stability of open loop and closed loop discrete-time systems.
3. Estimate the controllability and observability of discrete time systems and analyze the stability
4. Design digital controllers.
5. Design state feedback and output feedback controllers.

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

(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

COURSE OUTCOMES

On completion of the course students will be able to

1. Know the working of different converters like AC-AC, AC-DC & DC-AC.
2. Understand the characteristics of SCR, MOSFET & IGBT
3. Understand practically the turn on and turn off methods of SCRs
4. Capable to convert one particular frequency signal into different frequency signals.
5. Simulate and code programs in PSPICE for different power electronic converters

(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, Clanderson 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.
5. To understand various environmental issues in India

(A30556)CYBER SECURITY
(Common to all branches)

B. Tech (EEE) VI Sem

L	T	P	C
3	0	0	0

Unit-I

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

Unit-II

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

Unit-III

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

Unit-IV

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

Unit-V

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

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

TEXT BOOK:

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

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

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

Course Outcomes

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

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

END

(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/DCsystems
- To describe various protection methods for HVDC systems and Harmonics

UNIT-I: BASIC CONCEPTS: Necessity of HVDC systems, Economics and Terminal equipment of HVDCtransmission systems, Types of HVDC Links, Apparatus required for HVDC Systems, Comparison of ACand 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 Graetzcircuit, 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 andextinction 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 steadystate, 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- Characteristicsharmonics, adverse effects of harmonics, Calculation of voltage and Current harmonics, Effect of Pulsenumber 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 Kamakshaiah, V Kamaraju”, HVDC Transmission, TMH Publishers, 2011

REFERENCE BOOKS:

1. “S. Rao”, EHVAC and HVDC Transmission Engineering and Practice, Khanna publications, 3rdEdition 1999.
2. “Jos Arrillaga”, HVDC Transmission, The institution of electrical engineers, IEE power & energyseries 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 successful completion of this course, the studentscan be able to

1. Compare EHV AC and HVDC system and to describe various types of DC links
2. Analyze various converter Control Characteristics in HVDC systems
3. Describe various methods for the control of HVDC systems and to perform power flow analysisin AC/DC systems
4. Describe various protection methods for HVDC systems
5. Classify harmonics and design different types of filters

(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 successful completion of this subject, the 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,3rdEdition,2005.
2. Umanand L., Bhat S.R., “Design of magnetic components for switched Mode Power converters” Wiley Eastern Ltd.,2001.

Course Outcomes:

Upon successful completion of this subject, the 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

(A30240)HIGH VOLTAGE ENGINEERING
PROFESSIONAL ELECTIVE-IV

B.Tech EEE VII Sem **L T P C**
3 00 3

Course Objectives:

- To deal with the detailed analysis of Breakdown occurring in gaseous, liquids and soliddielectrics
- 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, Coronadischarge

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 ofinsulating 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 forimpulse voltage and current measurement, measurement of dielectric constant and loss factor, partialdischarge 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, Testingof insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformersand 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 EngineeringFundamentals”,Khanna Publishers, 1993.
2. E. Kuffel, W. S. Zaengl and J. Kuffel, “High Voltage Engineering Fundamentals”, NewnesPublication, 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:

Upon successful completion of this subject, the students will be able to

1. Realizetheimportanceof highvoltagetechnologyand itsapplications
2. Comprehendthebreakingphenomenaanddielectricstrengthofdiff erentmediums (solids, gaseous,liquids).
3. Designanalysis forthe measurementofhighvoltagesandcurrents.
4. Elucidatedifferentcausesofovervoltagesandinsulationcoordinati onforovervoltages
5. Distinguishdifferenttypesoftestingmethodologiesofvarioushigh voltageapparatus

(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. Classify the power quality problems
2. Identify the harmonic sources and the effects of harmonic distortion
3. Analyze voltage sag problems and suggest preventive techniques.
4. Analyze and mitigate the power quallity issues in industries
5. Elucidate the mitigation of interruptions & voltage sags.

(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 International (P) Limited, Publishers, 1997.

REFERENCE BOOKS

1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
2. 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

(A30243) FLEXIBLE ACTRANSMISSION SYSTEM 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 this course of students will be able to

1. Comprehend the importance of controllable parameters and benefits of FACTS controllers.
2. Analyze the performance of different voltage source converters
3. Recognize the significance of static shunt and series compensation
4. Demonstrate the stability enhancement of the transmission lines using SVC and STATCOM
5. Illustrate the functional operation and control of GCSC, TSSC and TCSC..

(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 ofrepairable systems.

UNIT – I: BASIC PROBABILITY THEORY

Elements of probability, probability distributions, Randomvariables, Density and Distribution functions- Binomial distribution- Expected value andstandard 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 ofnetwork Reliability / Unreliability - Series systems, Parallel systems- Series-Parallel systems-Partially redundant systems- Examples.

Network Modeling and Evaluation of Complex systems: Conditional probability methodtieset, Cutset approach- Event tree and reduced event tree methods- Relationships betweentie 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 ofSeries systems, Parallel systems – Partially redundant systems- determination of reliabilitymeasure- 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 successful completion of this course, the student will be able to

1. Apply the probability theory and binomial distribution to power system networks.
2. Model parallel and series networks.
3. Illustrate various reliability functions.
4. Summarize reliability analysis of various models through different methods reliability functions, repairable irreparable systems through markov modeling frequency and duration techniques.
5. Demonstrate the frequency and duration techniques.

(A30245) ADVANCED ELECTRICAL DRIVES
PROFESSIONAL ELECTIVE-V

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:

After successful completion of this course, the student will be able to

1. Explain the operation of power electronic converters and their control strategies.
2. Illustrate the vector control strategies for ac motor drives
3. Describe the various control strategies for synchronous machines
4. Explain the permanent magnet motor drives
5. Understand the implementation of the control strategies using digital signal processors.

(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 – Determination of Tolerance.
5. Dielectric oil testing using H.T testing Kit
6. Schering bridge& Anderson bridge.
7. Measurement of 3 phases reactive power with single-phase wattmeter.
8. 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 C.T by Null method
4. P.T. testing by comparison-V.G as Null detector-Measurement of % ratio error and phase angle of the given P.T.
5. LVDT and capacitance pickup-characteristics and Calibration
6. Resistance strain gauge-strain measurements and Calibration

Course Outcomes

After successful completion of this course, the student will be able to

1. Calibrate single phase energy meter, dynamometer power factor meter and Crompton's D.C Potentiometer.
2. Measure resistance, inductance and capacitance using suitable bridges practically.
3. Apply the single phase wattmeter method for measuring the 3 phase reactive power.
4. Measure the choke coil parameters
5. Make use of H.T testing kit to test dielectric strength

(A30422) MICROPROCESSORS & MICROCONTROLLERS LAB

B.Tech EEE VII Sem **L T P C**
0 0 0 1.5

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 andbit manipulation instructions of 8051.
11. Program and verify Timer/Counter in 8051.
12. Program and verify interrupt handling in 8051.
13. UART Operation in 8051.
14. Communication between 8051 kit and PC.
15. Interfacing LCD to 8051.
16. Interfacing matrix/keyboard to 8051.
17. Data transfer from Peripheral to memory through DMA controller 8237/8257.

Course Outcomes

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

1. Apply the programming knowledge on microprocessor and microcontroller.
2. Design the assembly level language program's for various applications
3. Analyze the interfacing of 8086 microprocessor with peripherals
4. Compare different implementations and designing with interfacing circuits
5. Choose the appropriate programming level for a specified application

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

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

Course Objective:
This course provides a detailed kkowledge on energy scenario, efficiency improving methodologies to conserve energy and also the essential techniques for bridging the energy demand and supply.

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, bench marking, 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 lballast, occupancy sensors, energy efficient lighting controls, energy saving potential of eachtechnology.

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)

Course Outcomes:

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

1. Explain the current energy scenario and importance of energy conservation.
2. Classify various forms of energy
3. Demonstrate the concepts of energy management and audit
4. Illustrate the methods of improving energy efficiency in different electricalsystems.
5. Explain the concepts of different energy efficient technologies

(A30231) AI TECHNIQUES IN ELECTRICAL ENGINEERING
PROFESSIONAL ELECTIVE-IV

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 andgenetic 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 knowledgeof 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 successful completion of this course, the student will be able to

1. Illustrate feed forward neural networks, feedback neural networks and learning techniques.
2. Explain various ANN paradigms
3. Understand fuzziness involved in various systems and fuzzy set theory.
4. Develop genetic algorithm for applications in electrical engineering.
5. Demonstrate the applications of various AI techniques

(A30413) DIGITAL SIGNAL PROCESSING
PROFESSIONAL ELECTIVE-VI

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

UNIT- I: INTRODUCTION TO DIGITAL SIGNAL PROCESSING

Discrete time signals & sequences, linear shift invariant systems, stability and causality, linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems.

Realization of Digital Filters: Applications of Z-transforms, solution of difference equations of digital filters, System function, Stability criterion, Frequency response of stable systems, Realization of digital filters – Direct, Canonic, Cascade and Parallel forms.

UNIT –II: DISCRETE FOURIER SERIES

DFS representation of periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT: Over – lap Add method, over – lap Save method, Relation between DTFT, DFS, DFT and Z-Transform.

Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 decimation-in-time and decimation – in-frequency FFT Algorithms, Inverse FFT, and FFT with general Radix-N.

UNIT- III: IIR DIGITAL FILTERS

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

UNIT- IV: FIR DIGITAL FILTERS

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

UNIT- V: MULTIRATE DIGITAL SIGNAL PROCESSING

Introduction, down sampling, Decimation, up sampling, interpolation, sampling rate conversion.

Finite word Length effects: Limit Cycles, Overflow oscillations, round-off noise in IIR digital filters, Computational output round off

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

Text Books:

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

References:

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

Course Outcomes

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

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

(A30554) JAVA PROGRAMMING (OPEN ELECTIVE)

B. Tech (EEE)

L	T	P	C
3	0	0	3

UNIT-I

Introduction: Java Essentials, JVM, Java Features, Creation and Execution of Programs, Data Types, Type Conversion, Casting, Conditional Statements, Loops, Branching Mechanism, Classes, Objects, Class Declaration, Creating Objects, Method Declaration and Invocation, Method Overloading, Constructors– Parameterized Constructors, Constructor Overloading, Cleaning-up unused Objects, Class Variables & Methods-static Keyword, this Keyword.

UNIT–II

Arrays: One-Dimensional Arrays, Two-Dimensional Arrays, Command-Line Arguments, Inner Class. **Inheritance**: Introduction, Types of Inheritance, extends Keyword, Examples, Method Overriding, super, final Keywords, Abstract classes, Interfaces, Abstract Classes Verses Interfaces.

UNIT–III

Packages–Creating and Using Packages, Access Protection, Wrapper Classes, String Class, StringBuffer Class. **Exception**: Introduction, Types, Exception Handling Techniques, User-Defined Exception.

UNIT-IV

Multithreading: Introduction, Main Thread, Creation of New Threads – By Inheriting the Thread Class or Implementing the Runnable Interface, Thread Lifecycle, Thread Priority, Synchronization.

UNIT–V

java.io Package, File Class, FileInputStream Class, FileOutputStream Class, Scanner Class, BufferedInputStream Class, BufferedOutputStream Class, RandomAccessFile Class.

Text Books:

1.Sachin Malhotra, Saurabh Choudhary, Programming in Java (2e), Oxford publications.

Reference Books:

1.Herbert Schildt, Java: The Complete Reference (9e), McGraw Hill Education;

2. C. Thomas Wu, An introduction to object-oriented programming with Java 5e), McGraw-Hill Education;

Course Outcomes

The student shall be able to:

1. Explain the OOPs concepts.
2. Describe various types of Inheritance in Java.
3. Develop robust Java applications using Packages, Exceptions.
4. Implement Java applications using Java Threads.
5. Design Java applications with various modes of Input and output

****END****

(A30531) PYTHON PROGRAMMING
(OPEN ELECTIVE)

B. Tech (EEE)	L	T	P	C
	3	0	0	3

UNIT-I

Introduction to Python, Installing Python. How a Program Works, Using Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.
Data types and Expressions: Strings, Assignment and Comments, Numeric Data Types and Character Sets, Expressions, Functions and Modules.

UNIT–II

Control Statements: Definite Iteration, Formatting Text for Output, Selection, Conditional Iteration. File and Exceptions: Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions. Functions: Introduction, Defining and Calling a Void Function, designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions-Generating Random Numbers, the math Module, Storing Functions in Modules.

UNIT–III

Python Data structures: Accessing Characters and Substrings in a String, Strings and Number System, String Methods, Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings. Text Files, Data Encryption, Lists, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples Sequences, Tuples. Dictionaries and Sets: Dictionaries, Sets, Serializing Objects. Recursion: Introduction, Problem Solving with Recursion, Examples of Recursive Algorithms

UNIT-IV

Design with Classes: Classes and Objects, Classes and Functions, Classes and Methods, Working with Instances, Inheritance and Polymorphism. Object-Oriented Programming: Procedural and Object-Oriented Programming, Classes, techniques for Designing Classes

UNIT–V

Graphical User Interfaces: Behavior of terminal based programs and GUI-based programs, Coding simple GUI-based programs, other useful GUI resources. GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

Simple Graphics and Image Processing: Overview of Turtle Graphics, Two dimensional Shapes, Colors and RBG System, Image Processing.

Text Books:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011,
   Cengage Learning.
2. Think Python First Edition, by Allen B. Downey, Orielly publishing

Reference Books:

1. Introduction to Computation and Programming Using Python. John V.Guttag, The MIT Press.
2. James Payne, Beginning Python using Python 2.6 and Python 3, Wrox publishing
3. Paul Gries, Practical Programming: An Introduction to Computer Science using Python 3, The Pragmatic Bookshelf, 2nd edition

Course Outcomes

Students shall be able to

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
2. Express different Decision-Making statements and Functions
3. Interpret Object oriented programming in Python
4. Summarize different File handling operations
5. Explain how to design GUI Applications in Python and evaluate different database Operations.

****END****

(A30555) INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS
(OPEN ELECTIVE)

	L	T	P	C
B. Tech (EEE)	**3**	**0**	**0**	**3**

UNIT-I

Introduction to Databases: Introduction, Traditional File-Based Systems, Database Approach, Roles in the Database Environment, Advantages and Disadvantages of DBMS, The Three-Level ANSI-SPARC Architecture,
Database Languages, Data Models, Functions of a DBMS, Components of DBMS. Relational Model: Introduction, Terminology, Integrity Constraints, Views. The Relational Algebra: Unary Operations, Set Operations, Join Operations, Division Operation, Aggregation and Grouping Operations.

UNIT–II

SQL: The ISO SQL Data Types, Integrity Enhancement Feature–Domain Constraints, Entity Integrity, Referential Integrity, General Constraints, Data Definition–Creating a Database, creating a Table, Changing a Table Definition, removing a Table, Creating an Index, Removing an Index, Views–Creating a View, Removing a View, View Resolution, Restrictions on Views, View Updatability 'WITH CHECK OPTION', Advantages and Disadvantages of Views, View Materialization.

UNIT–III

SQL: Introduction, Data Manipulation–Simple Queries, Sorting Results, Using the SQL Aggregate Functions, Grouping Results, Sub-queries, ANY and ALL, Multi-table Queries, EXISTS and NOT EXIST, Combining Result Tables, Database Updates.

UNIT-IV

Advanced SQL: The SQL Programming Language–Declarations, Assignments, Control Statements, Exceptions, Cursors, Subprograms, Stored Procedures, Functions, and Packages, Triggers, Recursion.

UNIT–V

Normalization: The Purpose of Normalization, How Normalization Supports Database Design, Data Redundancy and Update Anomalies, Functional Dependencies in brief, The Process of Normalization,1NF, 2NF, 3NF, BCNF.

TEXT BOOKS:

1.Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, McGraw-Hill Education, 2003
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, McGraw-Hill Education

REFERENCE BOOKS:

1.Thomas M. Connolly, Carolyn E. Begg, Database Systems–A Practical Approach to Design, Implementation, and Management (6e), Pearson publisher
2. RamezElmasri, Shamkant B. Navathe, Fundamentals of Database Systems, Pearson publisher

Course Outcomes
Students shall be able to

1. Describe Database Management System Architecture.
2. Create, update, modify Relational Database Objects.
3. Manipulate data in Relational Database
4. Develop PL/SQL programs using Cursors, Subprograms, Stored Procedures, Functions, and Packages, Triggers.
5. Explain the purpose of normalization and types Normal forms.

****END****

(A30537) DATA ANALYTICS WITH R
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT -I

Introduction, how to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes. R Programming Structures, Control Statements, Loops, - Looping Over Non-Vector Sets, - If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion

UNIT –II

Introduction of Data Science, Basic Data Analytics using R, R Graphical User Interfaces Data Import and Export, Attribute and Data Types, Descriptive Statistics, Exploratory Data Analysis, Visualization Before Analysis, Dirty Data, visualizing a Single Variable, Examining Multiple Variables, Data Exploration Versus Presentation

UNIT –III

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability- Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains

UNIT –IV

Discover R‘s packages to do graphics and create own data visualizations. Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function ,Customizing Graphs, Saving Graphs to Files. Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests, ANOVA

Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression-other Generalized Linear Models-Survival Analysis, Nonlinear Models, Splines- Decision- Random Forests,

UNIT –V

Overview of Clustering, K-means, Use Cases, Overview of the Method, Perform K-means Analysis using R. Classification, Decision Trees, Overview of a Decision Tree, Decision Tree Algorithms, Evaluating a Decision Tree. Decision Tree in R, Bayes ‘Theorem, Naïve Bayes Classifier, Smoothing, Naïve Bayes in R

Text Books:

1. The Art of R Programming, Norman Matloff, Cengage Learning
2. David Dietrich, Barry Heller and Beibei Yang, ―Data Science and Big Data
   Analytics: Discovering, Analyzing, Visualizing and Presenting Data‖, EMC
   Education Services,

Reference Books:

1. R in Action, Rob Kabacoff, Manning Nathan Marz, James Warren, ―Big Data-
   Principles and best practices of scalable real-time data systems‖, Edition 2015, DreamTech Press,

Course Outcomes

By the end of the course the student shall be able

1. Explain Data Science concepts.
2. Explore data and analyze it using R.
3. Implement classification, clustering and feature selection methods with R.
4. Understand Regression Generalized Linear Models.
5. Perform K-means Analysis using R.

****END****

(A30557)WEB PROGRAMMING
(OPEN ELECTIVE)

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

Unit-I

Structuring Documents for the Web: Introducing HTML and XHTML, Basic Text Formatting, Presentational Elements, Phrase Elements, Lists, Editing Text, Core Elements and Attributes, Attribute Groups Links and Navigation: Basic Links, Creating Links with the **< a>** Element, Advanced E- mail Links. Images, Audio, and Video: Adding Images Using the **<img>** Element, Using Images as Links Image Maps, Choosing the Right Image Format, Adding Flash, Video and Audio to your web pages. Tables: Introducing Tables, Grouping Section of a Table, Nested Tables, Accessing Tables Forms: Introducing Forms, Form Controls, Sending Form Data to the Server Frames: Introducing Frameset, <frame>Element, Creating Links Between Frames, Setting a Default Target Frame Using **<base>**Element, Nested Framesets, Inline or Floating Frames with **<iframe>**. Changing font size, color using of text using <font> Element, scrolling text/image using <marquee> Element

Unit-II

Cascading Style Sheets: Introducing CSS, where you can Add CSS Rules. **CSS Properties**: Controlling Text, Text Formatting, Text Pseudo Classes, Selectors, Lengths, Introducing the Box Model. **More Cascading Style Sheets:** Links, Lists, Tables, Outlines, the: focus and: activate Pseudo classes Generated Content, Miscellaneous Properties, Additional Rules, Positioning and Layout with CSS, **Page Layout**: Understating the Site’s Audience, Page Size, Designing Pages, coding your Design, Developing for Mobile Devices. **Design Issues:** Typography, Navigation, Tables, Forms.

Unit-III

Learning JavaScript: How to Add Script to Your Pages, the Document Object Model, Variables, Operators, Functions, Control Statements, Looping, Events, Built- In Objects, Working with JavaScript: Practical Tips for Writing Scripts, Form Validation, Form Enhancements, JavaScript Libraries. Putting Your site on the web: Meta tags, testing your site, Taking the Leap to Live, Telling the World about your site, Understanding your visitors.

Unit-IV

XML - Introduction, XML Basics, Structuring Data, XML Namespaces, Document Type Definitions (DTDs), W3C XML Schema Documents, XML Vocabularies, Extensible Style sheet Language and XSL Transformations, Document Object Model (DOM).

Unit-V

Ajax-Enabled Rich Internet Applications: introduction, history of Ajax, traditional web applications Vs Ajax Applications, RIAs with Ajax, Ajax example using XML HttpRequest object, XML and DOM, creating full scale Ajax-enabled application, Dojo Toolkit.

TEXT BOOK:

1. Jon Duckett, Beginning HTML, XTML, CSS and JavaScript
2. Dietel and Dietel : "Internet and World Wide Web - How to Program", 5th Edition, PHI/Pearson Education, 2011.

REFERENCE BOOKS:

1. Chris Bates, Web Programming
2. M. Srinivasan, Web Technology: Theory and Practice
3. Achyut S. Godbole, AtulKahate, Web Technologies
4. Kogent Learning Solutions Inc, Web Technologies Black Book
5. Ralph Moseley and M. T. Savaliya, Developing Web Applications

Course Outcomes

Students shall be able to

1. Write well-structured, easily maintained, standards-compliant, accessible HTML code.
2. write well-structured, easily maintained, standards-compliant CSS code to present HTML pages in different way
3. Use JavaScript to add dynamic content to pages.

4. Effectively debug JavaScript code, making use of good practice and debugging tools.
5. Use JavaScript to access and use web services for dynamic content (AJAX, JSON, etc.)

END

(A30542) CLOUD COMPUTING
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT -I

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT –II

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

UNIT –III

Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications, on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure Managing the Cloud application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT –IV

Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

UNIT –V

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue, service, Microsoft, Windows

Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform.

Text Books:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

Reference Books:

1. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly, SPD, rp2011.

Course Outcomes

By the end of the course student shall be able to

1. Explain Distributed System Modeling, Clustering and Virtualization
2. Discuss basic concepts of cloud computing.
3. Distinguish Infrastructure as a Service (IAAS) & Platform and Software as a Service (PAAS/SAAS).
4. Design & implement cloud computing applications.
5. Explore some important cloud computing driven commercial systems.

****END****

(A30538) DEEP LEARNING
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT -I

Introduction to Deep Learning, Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms.

UNIT –II

Regularization for Deep Learning Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised learning, Multi-task learning, Early Stopping, Parameter Typing and Parameter Sharing, Sparse Representations, Bagging and other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, tangent Prop and Manifold, Tangent Classifier.

UNIT –III

Optimization for Training Deep Models:

How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT –IV

Convolutional Networks

The Convolution Operation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks, Convolutional Networks and the History of Deep Learning.

UNIT –V

Applications: Large-Scale Deep Learning, Computer Vision, Speech recognition, Natural Language Processing, Other Applications.

TEXT BOOKS:

1. Deep Learning, Ian Goodfellow, YoshuaBengio and Aaron Courville, In
Preparation for MIT Press.
2. Artificial Neural Networks. Yegnanarayana, Prentice- Hall of India, 1999

REFERENCE BOOKS:

1. Neural Networks and Learning Machines. Haykin, Prentice Hall of India, 2010
2. Pattern Recognition and Machine Learning, C.M. Bishop, Springer, 2006

Course Outcomes

The students shall be able to

1.Explain Deep Feed-forward networks, Gradient-Based learning,
2.Describe regularization techniques for Deep learning
3.Differentiate learning and optimization in Deep learning.
4.State the significance of Convolutional Networks
5.State the applications of Deep Learning.

****END****

(A30559)INTRODUCTION TO DATA SCIENCE
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Unit-I

Introduction to Data Science: Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting.

Introduction to Programming Tools for Data Science: Toolkits using Python- Matplotlib, NumPy, Scikit-learn, NLTK.

Unit-II

Visualizing Data- Bar Charts, Line Charts, Scatterplots. **Working with data-** Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction

Unit-III

Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression-model assumptions, regularization (lasso, ridge, elastic net), **Classification and Regression algorithms-** Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM).

Unit-IV

Decision trees, and random forest, Classification Errors, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks- Learning & Generalization, Overview of Deep Learning.

Unit-V

Case Studies of Data Science Application: Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis.

TEXT BOOK:

1. Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media

2. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems", 1st Edition, O'Reilly Media

3. Jain V.K., “Data Sciences”, Khanna Publishing House, Delhi.
4. Jain V.K., “Big Data and Hadoop”, Khanna Publishing House, Delhi.
5. Jeeva Jose, “Machine Learning”, Khanna Publishing House, Delhi.

REFERENCE BOOKS:

1. Chopra Rajiv, “Machine Learning”, Khanna Publishing House, Delhi.
2. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Presshttp://www.deeplearningbook.org
3. Jiawei Han and Jian Pei, "Data Mining Concepts and Techniques", Third Edition, MorganKaufmann Publishers

Course Outcomes

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

1. Understanding the basics of data science and python programing environment
2. Illustrate various data visualization techniques
3. Demonstrate various machine learning concepts and classification, regression techniques
4. Understand the decision trees, neural networks, and basics of deep learning.
5. Analyzing the case studies in data science using realtime applications

END

(A30471) PRINCIPLES OF ELECTRONIC COMMUNICATIONS (OPEN ELECTIVE)

B. Tech (EEE)	L	T	P	C
	3	0	0	3

Unit- I: Introduction to Communication System

Block diagram of Communication system, Radio communication: Types of communications, Analog, Pulse, and Digital, Types of Signals, Fourier Transform for various signals, Fourier Spectrum, Power spectral density, Correlation, Convolution, Time Division Multiplexing, Frequency Division Multiplexing.

Unit- II: Amplitude Modulation

Need for modulation, Types of Amplitude modulation: AM, DSBSC, SSBSC, Power and BW requirements, Generation of AM, DSBSC, SSBSC, Demodulation of AM: Diode detector, Coherent detection of DSBSC& SSBSC.

Unit- III: Angle Modulation

Frequency & Phase Modulation, Advantages of FM over AM, Bandwidth consideration, Narrow band FM, Wide band FM, Comparison of FM and PM.

Pulse Modulation

Sampling, Sampling Theorem for Band limited signals, Types of Pulse modulation: PAM, PWM, PPM, Generation and demodulation of PAM, PWM, and PPM.

Unit- IV: Digital communication

Advantage, Block diagram of PCM, Quantization error, DPCM, Adaptive DPCM, DM and Comparison.

Digital Modulation: ASK, FSK, PSK, DPSK, QPSK, coherent and Non-coherent reception.

Unit- V: Information Theory

Concept of Information, Rate of Information and entropy, Source coding for optimum rate of information, Coding efficiency, Shannon Fano coding, Huffman Coding.

Error Control Coding: Introduction, Error detection and Correction codes, Block codes, Convolution codes.

Textbooks:

1. Communication Systems Analog and Digital–R. P. Singh, SD Sapre, TMH, 20th reprint, 2004.

2. Principles of Communication Systems – H Taub& D. Schilling, GautamSahe, TMH, 3rd Edition, 2007.
3. Communication Systems – B.P. Lathi, BS Publication, 2004.

References:

1. Analog and Digital Communication – K. Sam Shanmugam, Willey, 2005.
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.
3. Digital Communications- John G. Proakis, MasoudSalehi- 5th Edition, Mcgarw- Hill,2008.

Course Outcomes

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

1. 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.

END

(A30472) BASIC ELECTRONICS ENGINEERING
(OPEN ELECTIVE)

B. Tech (EEE)

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, transistorConstruction, BJTOperation, symbol, Common base, Common Emitter and Common Collector Configurations, Limits of operation, BJT Specifications, BJT Hybrid model, Determination of H parameters from Transistor characteristics, Comparison of CB, CE, and CC configurations.

UNIT- IV:
Transistor Biasing and Stabilization: Operating Point, The DC and AC Load lines, Need for Biasing, Fixed Bias, Collector to base bias Feedback, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against variations in V_{BE} and β, Bias Compensation using Diodes and Transistors, Thermal Runaway, Thermal Stability.

UNIT- V:
Field Effect Transistor: The Junction Field Effect Transistor (Construction, principle of operation, Symbol)- Pinch-off Voltage-Volt-Ampere characteristics, The JFET small signal model, MOSFET(Construction, principle of operation, Symbol), MOSFET Characteristics in Enhancement and Depletion modes.

TEXT BOOKS:
1. Millman's Electronic Devices & Circuits-J. Millman, C.C. Halkais&SatyabrataJit, 2 Ed., 1998, TMH.
2. Electronic Devices & Circuits- Mohammad Rashid, Cengage Learning, 2013
3. Electronic Devices & Circuits- David A. Bell, 5 Ed, Oxford

REFERENCE BOOKS:
1. Integrated Electronics- J. Millman and Christos C. Halkais, 1991 Ed., 2008, TMH.
2. Electronic Devices and Circuits- R.L. Boylstad and Louis Nashelsky, 9 Ed.,2006, PEI/PHI
3. Electronic Devices and Circuits- B. P. Singh, Rekha Singh, Pearson, 2 Ed, 2013.
4. Electronic Devices and Circuits- K. Lal Kishore, 2 Ed., 2005, BSP.
5. Electronic Devices and Circuits- Anil K. Maini, Varsha Agarwal, 1 Ed., 2009, Wiley India Pvt Ltd.
6. Electronic Devices and Circuits- S. Salivahanan, N. Suresh Kumar, A. Vallavaraj, 2 ed., 2008, TMH.

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

1. Classify different types of diodes and its characteristics.
2. Explain various rectifiers and filters.
3. Analyze the characteristics of BJT & FET.
4. Design the DC bias circuitry of BJT and explain its stability
5. Distinguish and explain the characteristics of various FET amplifiers.

END

(A30383) FUNDAMENTALS OF ENGINEERING MATERIALS (OPEN ELECTIVE)

B. Tech (EEE)

L	T	P	C
3	0	0	3

UNIT – I

Structure of Metals: Crystallography, Miller's indices, Packing Efficiency, Density calculations. Grains and Grain Boundaries. Effect of grain size on the properties. Determination of grain size by different methods. Constitution of Alloys: Necessity of alloying, Types of solid solutions, Hume - Rothery rules, Intermediate alloy phases.

UNIT –II

Phase Diagrams: Construction and interpretation of phase diagrams, Phase rule. Lever rule. Binary phase Diagrams, Isomorphous, Eutectic and Eutectoid transformations with examples.

UNIT – III

Steels: Iron-Carbon Phase Diagram and Heat Treatment: Study of Fe-Fe3C phase diagram. Construction of TTT diagrams. Annealing, Normalizing, Hardening and Tempering of steels, Hardenability. Alloy steels.

UNIT – IV

Cast Irons: Structure and properties of White Cast iron, Malleable Cast iron, Grey cast iron. Engineering Materials-III: Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminium and its alloys, Al-Cu phase diagram, Titanium and its alloys.

UNIT – V

Ceramics, Polymers and Composites: Crystalline ceramics, glasses, cermets: structure, properties and applications. Classification, properties and applications of composites. Classification, Properties and applications of Polymers.

TEXT BOOKS:

1. Material Science and Metallurgy/ Kodgire
2. Essentials of Materials Science and engineering / Donald R. Askeland / Thomson.

REFERENCE BOOKS:

1. Introduction to Physical Metallurgy / Sidney H. Avner.
2. Materials Science and engineering / William and callister.
3. Elements of Material science / V. Rahghavan

Course Outcomes:

At the end of the course the students are able to:

1. Identify the crystalline structure of steel.
2. Understand the theory of time temperature and transformation
3. Determine of different uses of heat treatment in steel.
4. Distinguish between the various forms of steel.
5. Understand the properties of non-ferrous alloys and uses of composite materials.

END

(A30377) BASICS OF THERMODYNAMICS
(OPEN ELECTIVE)

B. Tech (EEE)	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 (cpand cv), Heat interactions in a Closed System for various processes, Limitations of First Law,Concept of Heat Engine (H.E.) and Reversed H.E. (Heat Pump and Refrigerator), Efficiency/COP, Second Law: Kelvin-Planck and Clausius Statements, Carnot Cycle, Carnot Efficiency, Statement of Clausius Inequality, Property of Entropy, T-S and P-V Diagrams

UNIT - IV

Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas const.

Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet BulbTemperature, 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.

END

(A30258) BASICS OF POWER ELECTRONICS & DRIVES (OPEN ELECTIVE)

B. Tech (EEE)	L	T	P	C
	3	0	0	3

UNIT I: POWER SEMICONDUCTOR DEVICES

Power Semiconductor Devices Construction and Characteristics of Power diodes, Power Transistors, Power MOSFET, Insulated Gate Bipolar transistors (IGBTs) Introduction to Thyristor family: SCR, DIACs, TRIACs.

UNIT II: PHASE CONTROLLED (AC TO DC) CONVERTERS

Principle of phase-controlled converter operation; Operation of 1-phase half wave converter with R, RL and RLE load; 1- phase full wave converter, Bridge Configuration; Operation with R, RL, RLE load; Operation of 1-phase Semi-converter/ Half controlled converter:

UNIT III: THREE -PHASE CONVERTERS

Operation of half wave converter: Full wave fully controlled converters: Semi-controlled converter; Dual Converter: Principle and operation; Applications of AC-DC converters

UNIT IV: DC TO DC CONVERTERS

The chopper, Basic principle of DC chopper, Classification of DC choppers, Control strategies Basic DC-DC converter (switch regulator) topologies: Principle, operation Step-down (Buck), Step-up (Boost), Step up/down (Buck-Boost), Continuous conduction and Discontinuous conduction operation, Two zone operation, Four quadrant operation (Operating modes),

UNIT V: POWER CONVERTERS FED DRIVES

Single phase separately excited drives: Half Wave converter, Semiconverter and Fully Controlled converter based drives; Braking operation of separately excited drive Semi-converter and Fully Controlled converter based drives 3-phase separately excited drives: Half Wave converter, Semi-converter and Fully Controlled converter based drives; Principle of power control (motoring control) of separately excited and series motor with DC-DC Converter;

Text books:

1. M D Singh and K B Khanchandani, “Power electronics”, TMH, New Delhi, 2nd ed., 2007.
2. P.S. Bimbhra, “Power Electronics”, Khanna Publishers, New Delhi, 2012..
3. Muhammad H. Rashid, “Power Electronics - Circuits, Devices and Applications”, Prentice Hall of India, 3rd ed., 2003.

Reference Books:

1. VedamSubramanyam, “Power Electronics – Devices, Converters and Applications”, New Age International Publishers Pvt. Ltd., Bangalore, 2nd ed. 2006.
2. Ned Mohan, Undeland and Robbins, “Power Electronics – Converters, Applications and Design”, John Willey & sons, Inc., 3rd ed., 2003.
3. V.R.Moorthi, “Power Electronics”, Oxford University press, 2005.
4. G..K. Dubey, S.R. Doradla, A. Joshi, and R.M.K. Sinha, “Thyristorised Power Controllers”, New Age International Ltd. Publishers, 1986 (Reprint 2008).
5. P.T. Krein, “Elements of Power Electronics”, Oxford University Press, 1998.
6. G..K. Dubey, “ Fundamentals of Electrical Drives”, Narosa Publishing House, New Delhi, 2nd ed. 2001

Course Outcome:

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

1. Explain the construction and characteristics of Power semiconductor devices
2. Analyze the operation of single phase and three phase ac-to-dc converters.
3. Analyze various three phase converters
4. Compare the various types of dc-to-dc converters.
5. Apply the knowledge of power electronic converter for various applications.

END

(A30252) POWER GENERATION SYSTEMS
(OPEN ELECTIVE)

B. Tech (EEE)

L	T	P	C
3	0	0	3

UNIT I: THERMAL POWER PLANTS
Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers, FBCBoilers, Turbines, Condensers, Steam & Heat rate, Subsystems of thermal power plants - Fuel and ash handling, Draught system, Feed water treatment. Binary Cycles and Cogenerationsystems.

UNIT II: NUCLEAR POWER PLANTS

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors: Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANada-Deuterium-Uranium reactor (CANDU), Breeder, Gas Cooled and Liquid Metal Cooled Reactors.Safety measures for Nuclear Power plants.

UNIT III: SOLAR ENERGY
Principles of solar radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, instruments for measuring solar radiation and sun shine, solar radiation data. Photo-voltaic energy conversion.
Solar energy collection: Flat plate and concentrating collectors,
Storage and applications: solar ponds. Solar Applications - solar heating/cooling technique, solar distillation and drying.

UNIT-IV: WIND&BIO-MASS ENERGY:
Wind: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria
Bio-mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C. Engine operation and economic aspects.

UNIT-V: GEOTHERMAL &OCEAN ENERGY:
Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

TEXT BOOK:

1. Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.
2. Non-Conventional Energy Sources /G.D. Rai
3. Renewable Energy Technologies /Ramesh & Kumar /Narosa

REFERENCE BOOKS:

1. El-Wakil. M.M., "Power Plant Technology", Tata McGraw – Hill Publishing Company Ltd.,2010.
2. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw – Hill, 1998
4. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
5. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
6. Solar Energy /Sukhame

Course Outcomes:

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

1. Explain the construction and operation of thermal power plants
2. Analyze the operation of diesel, gas turbine and combined cycle power plants.
3. Illustrate the construction, operation and safety aspects of nuclear power plants.
4. Compare the power derived from renewable energy sources
5. Identify the economic aspects of power plants

(A30160) DISASTER MANAGEMENT AND MITIGATION (OPEN ELECTIVE)

	L	T	P	C
B. Tech (EEE)	**3**	**0**	**0**	**3**

UNIT - I:

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical reserches.

UNIT - II:

Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man indeced hazards & Disasters - Natural Hazards - Planetary Hazards / Disasters - Extra Planetary Hazards / disasters - Planetary Hazards - Endongenous Hazards - Exogenous Hazards

UNIT - III:

Endogenous Hazards - Volcanic eruption - Earthquakes - landslides - Volcanic Hazards / Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards / disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - Human adjusment, perception & mitigation of earthquake.

UNIT - IV:

Exogenous hazards / disasters - Infrequent events - Cumulative atmospheric hazards / disasters

Infrequent events: Cyclones - Lightning - Hailstorms

Cyclones: Tropical cyclones & Local stroms - Destruction by tropical cyclones & local stroms (causes, distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/ disasters :- Floods - Droughts - Cold waves - Heal waves Floods :- Causes of floods - Flood hazards India - Flood control measures (Human adjustment, perception & mitigation) Droughts :- Impacts of droughts - Drought hazards in India - Drought control measures - Extra Planetary Hazards / Disasters - man induced Hazards / Disasters - Physical hazards / Disasters - Soil erosion

Soil Erosion: Mechanics & forms of Soil Erosion - Factors 7 causes of Soil Erosion - Conservation measures of Soil Erosion.

Chemical hazards / disasters: Release of toxic chemicals, nuclear explosion - Sedimentation processes Sedimentation processes: - Global Sedimentation problems - Regional Sedimentation problems - Sedimentation & Environmental problems - Corrective measures of Erosion & Sedimentation

Biological hazards / disasters: Population Explosion.

UNIT - V:
Emerging approaches in Disaster Management - Three stages
Pre-disaster Stage (preparedness)

1. Emergency Stage
2. 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

REFERENCE BOOKS:
1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of
India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

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

1. Explain the Environmental Hazards & Disasters
2. Discuss about Types of Environmental hazards & Disasters
3. Explain the Endogenous Hazards Exogenous hazards
4. Apply Emerging approaches in Disaster Management
5. Recognizes the stakeholders in disaster management system, their jurisdiction and responsibilities

****END****

(A30161) REMOTE SENSING AND GIS
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT – I

Introduction to Photogrammetric: Principles& types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line.

UNIT – II

Remote Sensing: Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process. Electro-magnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.

UNIT – III

Geographic Information Systems: Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input- Attribute data Management –Data display- Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters commonly used Map Projections - Projected coordinate Systems

UNIT – IV

Vector Data Model: Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geo-base data model; Geometric representation of Spatial Feature and data structure, Topology rules

UNIT – V

Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data
Structure, Data Conversion, Integration of Raster and Vector data.

Data Input: Metadata, Conversion of Existing data, creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing.

TEXT BOOKS:

1. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
2. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
3. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-
Hill-2015

REFERENCES:

1. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India)Publications.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A.Mc Donnell, Oxford Publishers 2004.
3. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.

Course Outcomes:

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

1. Understand the basic concept of GIS and its applications; know different types of data representation in GIS.
2. Understand the principles of aerial and satellite remote sensing, Able to comprehend the energy interactions with earth surface features, spectral properties of water bodies.
3. Apply knowledge of GIS software and able to work with GIS software in various application fields.
4. Illustrate spatial and non-spatial data features in GIS and understand the map projections and coordinates systems.
5. Apply knowledge of GIS and understand the integration of Remote Sensing and GIS.

****END****

(C30161) LOGISTICS AND SUPPLY CHAIN MANAGEMENT (OPEN ELECTIVE)

	L	T	P	C
B. Tech (EEE)	3	0	0	3

Unit – I

Understanding the Supply Chain: Objective and Importance of Supply Chain Process View of Supply Chain. Competitive and Supply Chain Strategies, Achieving Strategic Fit, Expanding Strategic Scope. Logistics: The Logistical value preposition, The Work of Logistics, Logistical operations, Logistical operating arrangements, Supply chain Synchronization, Supply Chain Drivers and Metrics: Drivers for Supply Chain Performance, Framework for Structuring drivers. Facilities, inventory, transportation, information, sourcing and pricing. Obstacles to Achieving fit, Supply chain performance in India. Case studies.

Unit – II

Designing the Supply Chain Network : Role of distribution in the Supply Chain, Factors influencing Distribution network design, Design options for Distribution network, The role of network design in the Supply Chain, Frame work for Network design decisions, Models for facility location and capacity allocation, Planning Demand and Supply in a Supply Chain: Demand Forecasting in Supply Chain: Components of forecast and forecasting methods, Aggregate Planning in Supply Chain: Role of aggregate planning, Aggregate planning Strategies , Inventory planning and economic theory aberrations. Case studies

Unit – III

Planning and Managing inventories in Supply Chain: Managing Economies of Scale in Supply Chain, Managing Uncertainty in a Supply Chain, Determining optimal level of product inventory. Designing and Planning Transportation Networks: Transportation in a Supply Chain. Case studies

Unit – IV

Managing Cross Functional Drivers in a Supply Chain: Sourcing decisions in a Supply Chain and procurement strategies, Pricing and Revenue Management in a Supply Chain, Information Technology and Coordination in a Supply chain. Case studies

Unit- V

Logistics and Supply chain relationships: Identifying logistics performance indicators –Channel structure – Economics of distribution –channel relationships –logistics servicealliances. 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

Text Books:

1. Sunil Chopra and Peter Meindl: Supply chain Management: Strategy, Planning and Operation, Third edition, Pearson, 7th Edition, 2018
2. Donald J.Bowersox and David J.Closs: Logistical Management: The Integrated Supply Chain Process, TMH, 2006. 2nd Edition
3. Sridhara Bhat: Logistics and supply chain management, Himalaya, 1st Edition, 2016.
4. John T Mentzer: Supply Chain Management, Sage Publications, 2008 , 1st Edition
5. Donal Waters: Global Logistics, Kogan Page, 7th Edition, 2014
6. Christain schuh et al:The purchasing chess board, Springer link, 3rd Edition.
7. Philip B.Schary, TageSkjott-Larsen: Managing the Global Supply Chain, Viva, Edition 3, 2008.

Course Outcomes

1. Analyze growing importance of Supply Chain Management.
2. Identify Principles of SCM Costs and customer Profitability analysis.
3. Explain importance of Benchmarking in SCM
4. Outline CRM, Sourcing and factors considered for transportation
5. Evaluate Global aspects in SCM

****END****

(C30162) KNOWLEDGE MANAGEMENT
(OPEN ELECTIVE)

B. Tech (EEE)

L	T	P	C
3	0	0	3

Unit I

The Knowledge Economy: Leveraging Knowledge, Data-Information-knowledge-Wisdom relationship, organizational knowledge, characteristics and components of organizational knowledge –Building knowledge societies- Measures for meeting the challenges of implementing KM programmes.

Unit II

Knowledge Management and Information Technology: Role Information Technology in Knowledge Management Systems, Knowledge Management tools, Creative effective Knowledge Management Systems through Information Technology, ERP and BPR, Data Warehousing and Data Mining.

Unit III: Future of Knowledge Management and Industry perspective: Companies on the road to knowledge management, Knowledge Management in Manufacturing and service industry, challenges and future of Knowledge Management.

Unit IV

The Knowledge Process: Universal appeal, Stages of KM Process, Knowledge Capital vs physical capital, Customer Relationship Management, Business Ethics And KM, The Promise of Internet and the Imperatives of the new age.

Unit V

Implementation of Knowledge Management: Discussion on Roadblocks to success,10-step KM Road Map of 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.

Text Books:

1. Mattison: Web Warehousing & Knowledge Management, Tata McGraw-Hill,2009 ,2/e
2. Becerra Fernandez: Knowledge management: An Evolutionary view, PHI, 1st Edition,2009
3. Fernando:Knowledge Management, Routledge, 2nd Edition,2014
4. B.Rathan Reddy: Knowledge management, Himalaya,1st Edition, 2009
5. Tapan K Panda: Knowledge Management, Excel, 1st Edition, 2008.
6. Barnes: Knowledge Management systems, Cengage, 1st Edition, 2008.
7. Tiwana: The Knowledge Management tool kit, 2/e, Pearson Education, 2009.

Course Outcomes:

1. Understanding the key theories and models that inform 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 variousknowledge management formats and technologies
5. Implementing the ethical implications in managing knowledge

****END****

(A30473) IMAGE PROCESSING
(OPEN ELECTIVE)

B. Tech(EEE)	L	T	P	C
	3	0	0	3

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

Unit-II: Image Enhancement (Spatial Domain)
Introduction, Image Enhancement in Spatial domain, Enhancement through point processing, Types of point processing, 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, low pass filter (smoothing) and high pass filter (sharpping), image Smoothing&Sharpening.

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

Course Outcomes

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

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

****END****

(A30474) DIGITAL ELECTRONICS
(OPEN ELECTIVE)

B. Tech (EEE)

L	T	P	C
3	0	0	3

UNIT I:

NUMBER SYSTEM AND BOOLEAN ALGEBRA AND SWITCHING FUNCTIONS

Number Systems, Base Conversion Methods, Complements of numbers, Codes – binary codes, Binary Coded Decimal code and its properties, unit Distance Codes, Alpha Numeric Codes, Error Detecting and Correcting Codes.

Boolean Algebra: Basic theorems and properties - Switching Functions, Canonical and Standard Forms-Algebraic simplification Digital Logic Gates, Properties of XOR gates &Universal Gates-Multilevel NAND/NOR realizations.

UNIT-II:

MINIMIZATION AND DESIGN OF COMBINATIONAL CIRCUITS:

Introduction, The Minimization methods with Theorem, The Karnaugh Map Method, Five and Six Variable Maps, Prime and Essential Implicants, Don't Care Map Entries, Minimization using tabular method, Partially Specified Expressions Multi Output minimization and combinational design, ArithmeticCircuits, Comparator, Multiplexer, Code-converters.

UNIT-III:

FUNDAMENTALS OF SEQUENTIAL MACHINES

Introduction, Basic Architectural Distinctions between combinational and sequential circuits. The Binary Cell, Fundamentals of Sequential Machine Operations, The Flip-flop, D-Latch &Flip-flop, the clocked T-flip-flop, the clocked J-K flip-flop, Design of a clocked flip-flop. Conversion from one type of Flip-Flop to another, Timing and Triggering Consideration.

UNIT-IV:

SEQUENTIAL CIRCUIT DESIGN AND ANALYSIS

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

Counters –Design of single mode counter, Ripple counter, Ring counter, Shift register, Shift register sequences, Ring counter using Shift register.

UNIT-V:
FSM Charts: Finitestate machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and Merger chart methods-concept of minimal cover table.

TEXT BOOKS:
1. Switching& Finite Automata theory – ZviKohavi, &Niraj K. Jha, 3rd Edition, Cambridge.
2. Digital Design -Morris Mano, PHI, 3rd Edition, 2006.

REFERENCE BOOKS:
1 Introduction to switching design and logic design _ Fredriac J. Hill, Gerald R. Peterson, 3rd ED, John Wiley & Sons Inc
2. Digital fundamentals – A Systems approach-Thomas L. Floyd, Pearson, 2013.
3. Digital logic design- Ye Brian and Holds Worth, Elsevier.
4. Fundamentals of Logic Design - Charles H. Roth, Thomson Publications, 5th Edition, 2004.
5. Digital Logic Applications and Design - John M. Yarbrough, Thomson Publications, 2006.
6. Digital Logic and state machine design – Comer, 3rd, oxford, 2013.

Course Outcomes
At the end of the course the student will be able to:
1. Identify the various numeric and binary Numbers.
2. Apply the basic theorems to simply the Boolean Functions.
3. Design simple Combinational Circuits.
4. Design simple Sequential Circuits.
5. Distinguish the Finite State Machines

END

(A30357) FUNDAMENTALS OF MANUFACTURING PROCESSES
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT – I

Casting: Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of moulding sands. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design.

UNIT – II

Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding. Inert Gas Welding - TIG Welding, MIG welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non-destructive testing of welds.

UNIT – III

Hot working, cold working, strain hardening, recovery, recrystallisation, and grain growth. Stamping, forming, and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning. Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – IV

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion

UNIT – V

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects –cold forging, swaging, Forces in forging operations.

TEXT BOOKS:

1. Manufacturing Technology / P.N. Rao / Mc Graw Hill
2. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson.

REFERENCE BOOKS:

1. Metal Casting / T.V Ramana Rao / New Age
2. Métal Fabrication Technology/ Mukherjee/PHI

Course Outcomes:

For given product, one should be able identify the manufacturing process.

1. Understand the idea for selecting materials for patterns.
2. Learn different types and allowances of patterns used in casting and analyze the components of moulds.
3. Design core, core print and gating system in metal casting processes Understand arc, gas, solid state and resistance welding processes.
4. Develop process-maps for metal forming processes using plasticity principles.
5. Identify the effect of process variables to manufacture defect free products.

****END****

(A30379) FUNDAMENTALS OF AUTOMOBILE ENGINEERING
(OPEN ELECTIVE)

B. Tech (EEE)

L	T	P	C
3	0	0	3

Unit – I

Introduction: Components of four-wheeler automobile – chassis and body – power unit – power transmission rear wheel drive, front wheel drive, 4-wheel drive – types of automobile engines, engine construction – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, re boring, decarburization

Unit – II

Fuel System: S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pumps – Carburetor – types – air filters – petrol injection.
C.I. Engines: Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, Alternative fuels for Automobiles-injection, Classification, Properties, Hybrid vehicles injection timing, testing of fuel, pumps.
Cooling System: Cooling Requirements, Air Cooling, Liquid Cooling and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporating cooling – pressure sealed cooling – antifreeze solutions.

Unit – III

Electrical System: Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.
Ignition System: Function of an ignition system, battery ignition system, constructional features of storage battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

Unit – IV

Transmission System: Clutches, principle, types- cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid

fly wheel – Gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter.
Propeller shaft – Hoatch – Kiss drive, Torque tube drive universal joint, differential rear axles – types – wheels and tyres.
Steering System: Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism

Unit-V Suspension System: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.
Braking System: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.

TEXT BOOKS

1. Automobile Engineering, Vol. 1 & Vol. 2/ Kripal Singh
2.Automobile Engineering, Vol. 1 & Vol. 2 ,by K.M Gupta,Umesh publication

REFERENCE BOOKS

1. A System approach to Automotive Technology by Jack Erjavec YesDee publishing Pvt Ltd.
2. Automobile Engineering / William Crouse
3. Automotive Mechanics / Heitner
4. Alternative fuels of Automobiles by P. Rami Reddy, Frontline publications.

Course outcomes:

By undergoing this course, a student shall be able to
1. Identify power generation, transmission and control mechanisms in an automobile
2. Manipulate the chemical, thermal, mechanical and electrical energies in an automobile
3. Infer the interaction between subsystems
4. Analyze how transmission system works
5. Learn different components of suspension systems.

****END****

(A30259) ELECTRICAL & HYBRID VEHICLES
(OPEN ELECTIVE)

B. Tech (EEE)	L	T	P	C
	3	0	0	3

UNIT I: INTRODUCTION TO HEV
Configuration of Electric Vehicles, Performance of Electric Vehicles, Traction motor characteristics, Tractive effort and Transmission requirement, Vehicle performance, Tractive effort in normal driving, Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains

UNIT II: ENERGY STORAGE FOR EV AND HEV
Energy storage requirements, Battery parameters, Types of Batteries, Modelling of Battery, Fuel Cell basic principle and operation, Types of Fuel Cells, PEMFC and its operation, Modelling of PEMFC, Super Capacitors

UNIT III: ELECTRIC PROPULSION

EV consideration, DC motor drives and speed control, Induction motor drives, Permanent Magnet Motor Drives, Switch Reluctance Motor Drive for Electric Vehicles, Configuration and control of Drives.

UNIT IV: DESIGN OF ELECTRIC AND HYBRID ELECTRIC VEHICLES
Series Hybrid Electric Drive Train Design: Operating patterns, control strategies, Sizing of major components, power rating of traction motor, power rating of engine/generator, design of PPS Parallel Hybrid Electric Drive Train Design: Control strategies of parallel hybrid drive train, design of engine power capacity, design of electric motor drive capacity, transmission design, energy storage design

UNIT V: POWER ELECTRONIC CONVERTER FOR BATTERY CHARGING
Charging methods for battery, Termination methods, charging from grid, The Z-converter, Isolated bidirectional DC-DC converter, Design of Z converter for battery charging, High-frequency transformer based isolated charger topology, Transformer less topology

TEXT BOOKS:

1. M. Ehsani, Y. Gao, S. Gay and Ali Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, CRC Press, 2005
2. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003

REFERENCE BOOKS:

1. Sheldon S. Williamson, Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles, Springer, 2013.
2. C.C. Chan and K.T. Chau, Modern Electric Vehicle Technology, OXFORD University Press, 2001.
3. Chris Mi, M. Abul Masrur, David Wenzhong Gao, Hybrid Electric Vehicles Principles and Applications with Practical Perspectives, Wiley Publication, 2011.

List of Open Source Software/learning website:

- E-materials available at the website of NPTEL- http://nptel.ac.in/

MATLAB (Trial version): Software is useful for simulation and analysis of electrical systems

Course Outcome:

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

1. Demonstrate the working of Electric Vehicles and recent trends
2. Analyze the energy storage requirements of EV and HEV
3. Develop the electric propulsion unit and its control for application of electric vehicles
4. Make use of various parameters for the design of EV and HEV
5. Analyze different power converter topology used for electric vehicle application

****END****

(A30260) ELECTRICAL SAFETY
(OPEN ELECTIVE)

B. Tech (EEE)

L	T	P	C
3	0	0	3

UNIT I: CONCEPTS AND STATUTORY REQUIREMENTS

Introduction – electrostatics, electro magnetism, stored energy, energy radiation and electromagnetic interference – Working principles of electrical equipment-Indian electricity act and rules-statutory requirements from electrical inspectorate-international standards on electrical safety – first aid-cardio pulmonary resuscitation (CPR).

UNIT II: ELECTRICAL HAZARDS

Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity. Energy leakage-clearances and insulation-classes of insulation-voltage classifications-excess energy current surges-Safety in handling of war equipments-over current and short circuit current-heating effects of current-electromagnetic forces-corona effect-static electricity –definition, sources, hazardous conditions, control, electrical causes of fire and explosion-ionization, spark and arc ignition energy-national electrical safety code ANSI. Lightning, hazards, lightning arrestor, installation – earthing, specifications, earth resistance, earth pit maintenance.

UNIT III: PROTECTION SYSTEMS

Fuse, circuit breakers and overload relays – protection against over voltage and under voltage – safe limits of amperage – voltage –safe distance from lines-capacity and protection of conductor-joints-and connections, overload and short circuit protection-no load protection-earth fault protection. FRLS insulation-insulation and continuity test-system grounding-equipment grounding-earth leakage circuit breaker (ELCB)-cable wires-maintenance of ground-ground fault circuit interrupter-use of low voltage-electrical guards-Personal protective equipment – safety in handling hand held electrical appliances tools and medical equipments.

UNIT IV: SELECTION, INSTALLATION, OPERATION AND MAINTENANCE

Role of environment in selection-safety aspects in application - protection and interlock-self diagnostic features and fail-safe concepts-lock out and work permit system-discharge rod and earthing devices safety in the use of portable tools-cabling and cable joints-preventive maintenance.

UNIT V: HAZARDOUS ZONES

Classification of hazardous zones-intrinsically safe and explosion proof electrical apparatus-increase safe equipment-their selection for different zones-temperature classification-grouping of gases-use of barriers and isolators-equipment certifying agencies.

REFERENCE BOOKS

1.” Accident prevention manual for industrial operations”, N.S.C., Chicago, 1982.
2. Indian Electricity Act and Rules, Government of India.
3. Power Engineers – Handbook of TNEB, Chennai, 1989.
4. Martin Glov Electrostatic Hazards in powder handling, Research Studies Pvt. Ltd., England1988.
5. Fordham Cooper, W., “Electrical Safety Engineering” Butterworth and Company, London, 1986.

Course Outcomes:

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

1. Illustrate the concept and necessity of electrical safety
2. Explain the possibilities of electrical hazards and its preventive measures
3. Identify the appropriate protective system to be adopted against various electrical hazards
4. Demonstrate the selection, installation, operation of various protective equipments.
5. Compare various hazardous zone and to identify the appropriate protective equipment for those zones

END

(A30162) GREEN BUILDINGS
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT I - INTRODUCTION

A historical perspective. General premises and strategies for sustainable and green design, objectives and basis. Bio-mimicry as a design tool based on ecosystem analogy.

UNIT II - GREEN CONSTRUCTION AND ENVIRONMENTAL QUALITY

Sustainable architecture and Green Building: Definition, Green building evaluation systems; LEED Certification; Green Globe Certification; Case studies which look at the environmental approach; Renewable Energy; Controlling the water cycle, Impact of materials on environment; Optimizing construction; Site management; Environmental management of buildings.

UNIT III - PASSIVE DESIGN IN MATERIALS

Passive Design and Material Choice – Traditional Building Materials – Importance of envelopematerial in internal temperature control – Specification for walls and roofs in different climate –Material and Humidity Control.

UNIT IV - ECO HOUSE

The form of the house, the building as an analogy. Building concepts: energy loss, insulation, passive solar gain, active solar gain, health benefits, and sustainable materials. Small scale wind and hydro power systems. Case study of eco house.

UNIT V - SUSTAINABLE AND GREEN BUILDING DESIGN STUDIO

This studio will explore collaborative learning to explore, investigate and apply various parameters of sustainability for design development of projected building/ urban scenarios.

REFERENCE BOOKS

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.

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

1. Understand the concepts of green buildings
2. Explain the sustainability.
3. Define renewable energy conservation through material usage.
4. Explain the Eco House system
5. Designing green buildings.

END

(A30163) AIR POLLUTION AND CONTROL
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT – I

Introduction: Definition, Sources, classification and characterization of air pollutants. Effects of air pollution on health, vegetation & materials. Types of inversion, photochemical smog.

UNIT – II

Meteorology: Temperature lapse rate & stability, wind velocity & turbulence, plume behavior, measurement of meteorological variables, wind rose diagrams, Plume Rise, estimation of effective stack height and mixing depths.

UNIT – III

Sampling: Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants (PM2.5, PM10, SOX, NOX, CO, NH3). Development of air quality models-Gaussian dispersion model-Including Numerical problems.

UNIT – IV

Control Techniques: Particulate matter and gaseous pollutants- settling chambers, cyclone separators, scrubbers, filters & ESP - Including Numerical problems. Site selection for industrial plant location.

UNIT – V

Air pollution due to automobiles, standards and control methods. Noise pollution- causes, effects and control, noise standards. Environmental issues, global episodes. Environmental laws and acts.

TEXTBOOKS:

1. M. N. Rao and H V N Rao, “Air pollution”, Tata Mc-G raw Hill Publication.
2. H. C. Perkins, “Air pollution”. Tata McGraw Hill Publication.

3. Mackenzie Davis and David Cornwell, “Introduction t o Environmental Engineering” McGraw-Hill Co.

REFERENCE BOOKS:

1. Noel De Nevers, “Air Pollution Control Engineering”, Waveland Pr Inc.
2. Anjaneyulu Y, “Text book of Air Pollution and Control Technologies”, Allied Publishers.

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

1. Identify the major sources of air pollution and understand their effects on health and environment.
2. Evaluate the dispersion of air pollutants in the atmosphere and to develop air quality models.
3. Ascertain and evaluate sampling techniques for atmospheric and stack pollutants.
4. Choose and design control techniques for particulate and gaseous emissions.
5. Demonstrates the knowledge about Air pollution control which is essential for environmental protection and it gives a particular solution to the life threating problem.

END

(C30163) MANAGEMENT OF INDUSTRIAL RELATIONS (OPEN ELECTIVE)

	L	T	P	C
B. Tech (EEE)	**3**	**0**	**0**	**3**

Unit I:

Industrial Relations: Introduction, concepts, importance of Industrial relations, scope and aspects of industrial relations, the management, the government factors affecting industrial relations, evolution of industrial relations policy, the industrial policy resolution 1991.

Unit II:

Anatomy of Industrial disputes and resolutions-I: industrial disputes, classification, causes, tripotisim, bipotism Tripartite and Bipartite Bodies, Standing orders and Grievance Procedure.

Unit III:

Anatomy of Industrial disputes and resolutions-II: Collective Bargaining, Conciliation, Arbitration, Adjudication, The Industrial Dispute Act 1947, Labour Welfare work, Labour Welfare officer, Worker's Participation.

Unit IV:

Industrial relations legislation-I: Wage Policy and Wage Regulation Machinery, Wage Legislation, Payment of Wages Act 1936, The Payment of Bonus Act,1965, Minimum wages Act-1948.

Unit V:

Industrial relations legislation-II: The Factories Act 1948, Mines Act 1952, Industrial Relations and Technological Change.

Journals: Indian Journal of Industrial Relation; NHRD Journal of Career Management; Management and Labour Studies; Personnel today; Leadership excellence; Indian Journal of Training & Development.

Text Books:

1. ArunMonappa (2012). Industrial Relations. New Delhi: Tata McGraw- Hill Publishing Company Ltd, 2nd Edition.
2. Mamoria C.B, Mamoria, G. (2010). Dynamics of Industrial Relations. New Delhi: Himalayan Publications, 16th Edition, 2019
3. Padhi, P.K. (2012). Labour & Industrial Laws. New Delhi: PHI Learning P. Ltd, 2nd Edition.
4. Kapoor, N.D. (2014). Elements of Mercantile Law. New Delhi: S.Chand& Co., 38th Edition
5. Subramani, P N. &Rajendran, G. (2001). Human Resources Management and Industrial Relations. New Delhi: Himalaya Publishing House, 1st Edition.
6. Pylee, P V. & A Simon George. (1995). Industrial relations and personnel Management. New Delhi: Vikas Publishing House Pvt. Ltd., New Delhi, 2nd Edition.
7. Verma, P. (1991). Management of Industrial Relations Reading and cases. Oxford and IBH publications, 4th Edition.

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.

****END****

(C30164) ENTREPRENEURSHIP
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Unit I:

Understanding Entrepreneurial Mindset- The revolution impact of entrepreneurship- The evolution of entrepreneurship- Approaches to entrepreneurship- Process approach- Twenty first centaury trends in entrepreneurship.

Unit II:

The individual entrepreneurial mind-set and Personality- The entrepreneurial journey- Stress and the entrepreneur- the entrepreneurial ego- Entrepreneurial motivations. Corporate Entrepreneurial Mindset- the nature of corporate entrepreneur- conceptualization of corporate entrepreneurship Strategy-sustaining corporate entrepreneurship.

Unit III:

Launching Entrepreneurial Ventures- opportunities identification- entrepreneurial Imagination and Creativity- the nature of the creativity process-Innovation and entrepreneurship. Methods to initiate Ventures- Creating new ventures-Acquiring an Established entrepreneurial venture- Franchising-hybrid- disadvantage of Franchising.

Unit IV:

Legal challenges of Entrepreneurship-Intellectual property protection-Patents, Copyrights-Trade marks and Trade Secrets- Avoiding trademark pitfalls. Formulation of the entrepreneurial Plan- The challenges of new venture start-ups, Poor financial Understanding- Critical factors for new venture development-The Evaluation Process- Feasibility criteria approach.

Unit V:

Strategic perspectives in entrepreneurship- Strategic Planning- Strategic actions- strategic positioning-Business stabilization- Building the adaptive firms-Understanding the growth stage-Unique managerial concern of growing ventures.

Text Books:

1. D F Kuratko and T V Rao "Entrepreneurship- A South-Asian Perspective "Cengage Learning, 1st edition, 2012. **(For PPT, Case Solutions Faculty may visit : login.cengage.com)**
2. Vasant Desai "Small Scale industries and entrepreneurship" Himalaya publishing, 9th Edition, 2017.
3. Rajeev Roy "Entrepreneurship" 2e, Oxford, 2012.
4. B.Janakiram and M.Rizwana" Entrepreneurship Development :Text & Cases, Excel Books, 1st Edition, 2011.
5. Stuart Read, Effectual Entrepreneurship, Routledge, 2nd Edition, 2013.
6. Robert Hisrich et al "Entrepreneurship" 6th e, TMH, 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.

****END****

(A30475) DATA COMMUNICATIONS
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Unit I:

Introduction to data communications, networking, signals, noise, modulation and demodulation. Data communication network architecture, layered network architecture, open systems interconnection, data communications circuits, serial and parallel data transmission, data communications circuit arrangements, data communication networks, alternate protocol suites. Information capacity, bits, bit rate, baud, and M-ARY encoding.

Unit II:

Metallic cable transmission media & optical fiber transmission media: metallic transmission lines, transverse electromagnetic waves, characteristics of electromagnetic waves, transmission line classifications, metallic transmission line types, metallic transmission line equivalent circuit, wave propagation on metallic transmission lines, metallic transmission line losses, block diagram of an optical fiber communications system, optical fiber versus metallic cable facilities.

Unit III:

Digital transmission & multiplexing and t-carriers digital transmission: pulse modulation, pulse code modulation, dynamic range, signal–to-quantization noise voltage Ratio, linear versus nonlinear PCM codes

Multiplexing: Time- division multiplexing, t1 digital carrier system, north American digital multiplexing hierarchy, digital line encoding, t carrier systems, European digital carrier system, statistical time – division multiplexing, frame synchronization, frequency- division multiplexing, wavelength- division multiplexing, synchronous optical network

Unit IV:

Telephone instruments and signals: The subscriber loop, standard telephone set, basic telephone call procedures, call progress tones and signals, cordless telephones, caller id, electronic telephones, paging systems.

The telephone circuit: The local subscriber loop, telephone message-channel noise and noise weighting, units of powers measurement, transmission parameters and private-line circuits, voice-frequency circuit arrangements, crosstalk.

Unit V:
Data communication codes, bar codes, error control, error detection, error correction, data formats, data communications hardware, character synchronization.

TEXT BOOKS:
1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education.

REFERENCE BOOKS:
1. Data Communications and Networking, Behrouz A Forouzan, Fourth Edition.Tmh.
2. Computer Communications and Networking Technologies, Gallow, Secondedition Thomson
3. Computer Networking and Internet, Fred Halsll, Lingana Gouda Kulkarni, Fifth Edition, Pearson Education

Course Outcomes:
At the end of the course, the student will be able to:
1. Explain the basic concepts of data communication systems.
2. Distinguish various types of transmission medias for data communications.
3. Compare different multiplexing techniques for digital transmission
4. Analyze different telephone instruments, signal and circuits
5. Identify different error detecting and correcting codes

****END****

(A30476) MICROCONTROLLERS & APPLICATIONS (OPEN ELECTIVE)

B. Tech (EEE)	L	T	P	C
	3	0	0	3

UNIT-I

Introduction to Microprocessors and Microcontrollers: Introduction to Microprocessor and Microcontroller, Number system and Binary arithmetic. Microprocessor Architecture (8085 and 8086) and Microcomputer System, memory map and addressing, memory classification, review of logic device for Interfacing, Memory Interfacing, Overview of 8086 Instruction Set, stacks and Interrupts.

UNIT-II

The 8051 Architecture: 8051 Microcontroller hardware, Program Counter and Data Pointer, A and B CPU registers, Flags and Program Status Word (PSW),Internal Memory : Internal RAM – Stack and Stack Pointer, Special Function Registers, Internal ROM, Input / Output Pins, ports and Circuits, External Memory, Timers and Counters, Serial data Input/ Output, interrupts.

UNIT-III

8051 Instruction set: Assembly Language Programming Process, Addressing Modes, Assembler Directives, Data Transfer, Arithmetic, Logical and Branch Instructions, Decimal Arithmetic, Interrupt Programming, Serial Data Communication.

8051 Programming: Basic Assembly Language Programming, Input/ Output Port Programming, 8051 Timer/Counter Programming, 8051 Serial Communication Programming, 8051 Interrupt Programming.

UNIT-IV

8051 Applications: Introduction, Interfacing Keyboards, Key pads, Interfacing Displays (Seven Segment Displays and LCD's), Interfacing A/D Convertors, Interfacing D/A Convertors, Interfacing Hardware Circuits for Multiple Interrupts, 8051 Interfacing with 8255, Interfacing Eternal Memory with 8051.

UNIT-V

Introduction to Advanced Architectures: ARM and SHARC, Processor and memory organization and Instruction level parallelism; Networked embedded System: Bus protocols, I2 bus and Can bus; Internet-Enabled Systems, Design Example-elevator Controller.

TEXT BOOKS:

1. K.J. Ayala “The 8051 Micro controller, Architecture, Programming 8- Applications “Thomson Delmar Learning
2. RS Gaonkar, “Microprocessors Architecture, Programming and Applications “Penram International.
3. M. A. Mazidi& J.G Mazidi." The 8051 Micro controller 8- Embedded System “Pearson Education.

REFERENCE BOOKS:

1. B. Ram “Fundamentals of Microprocessors and Microcomputers “DhanpatRai and Sons.
2. ‘Computers as Components- Principles of Embedded Computing System Design’, Wayne Wolf, Elsevier (2nd Edition)
3. Advanced µp & peripherals- A.K. Raj & KM Bhardhadi, TMF 2nd Edition

Course Outcomes:

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

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

.

****END****

(A30382) FUNDAMENTALS OF MECHANICAL ENGINEERING
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT - I

Introduction: Prime movers and its types, Concept of Force, Pressure, Energy, Work, Power, System, Heat, Temperature, Specific heat capacity, Change of state, Path, Process, Cycle, Internal energy, Enthalpy, Statements of Zeroth Law and First law.

Energy: Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydel, Solar, wind, and bio-fuels, Environmental issues like Global warming and Ozone depletion.

UNIT - II

Properties of gases: Gas laws, Boyle's law, Charle's law, Combined gas law, Gas constant, Relation between Cp and Cv, Various non-flow processes like constant volume process, constant pressure process, Isothermal process, Adiabatic process, Poly-tropic process

Properties of Steam: Steam formation, Types of Steam, Enthalpy, Specific volume, Internal energy and dryness fraction of steam, use of Steam tables, steam calorimeters.

Steam Boilers: Introduction, Classification, Cochran, Lancashire and Babcock and Wilcox boiler, functioning of different mountings and accessories.

UNIT - III

Heat Engines: Heat Engine cycle and Heat Engine, working substances, Classification of heat engines, Description and thermal efficiency of Carnot; Rankine; Otto cycle and Diesel cycles.

Internal Combustion Engines: Introduction, Classification, Engine details, four- stroke/ two-stroke cycle Petrol/Diesel engines, indicated power, Brake Power, Efficiencies.

UNIT - IV

Pumps: Types and operation of Reciprocating, Rotary and Centrifugal pumps, Priming Air Compressors: Types and operation of Reciprocating and Rotary air compressors, significance of Multistage.

Refrigeration & Air Conditioning: Refrigerant, Vapor compression refrigeration system, vapor absorption refrigeration system, Domestic Refrigerator, Window and split air conditioners.

UNIT - V

Couplings, Clutches and Brakes: Construction and applications of Couplings (Box; Flange; Pin type flexible; Universal and Oldham), Clutches (Disc and Centrifugal), and Brakes (Block; Shoe; Band and Disc).

Transmission of Motion and Power: Shaft and axle, Belt drive, Chain drive, Friction drive, Gear drive.

TEXT BOOKS:

1.Basic Mechanical Engineering / Pravin Kumar/ Pearson 2. Introduction to Engineering Materials / B.K. Agrawal/ Mc Graw Hill

REFERENCE BOOKS:

1. Fundamental of Mechanical Engineering/ G.S. Sawhney/PHI
2. Thermal Science and Engineering / Dr. D.S. Kumar/ Kataria

Course outcomes:

By undergoing this course, a student shall be able to

1. Understand different types of fuels.
2. Explain properties of steam
3. Understand the working Principle of IC Engines.
4. Explain the operations of types of pumps.
5. Know the application of mechanical drives in Transmission of Power.

****END****

(A30378) WASTE TO ENERGY
(OPEN ELECTIVE)

B. Tech (EEE)

L	T	P	C
3	0	0	3

Unit-I:

Introduction to Energy from Waste: Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

Unit-II:

Biomass Pyrolysis: Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods – Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

Unit-III:

Biomass Gasification: Gasifiers – Fixed bed system – Downdraft and updraft gasifiers –Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

Unit-IV:

Biomass Combustion: Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

Unit-V:

Biogas: Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion – Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

TEXT BOOKS:

1. Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.

REFERENCE BOOKS:

1. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
2. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons,1996.

Course Outcomes:

By undergoing this course, a student shall be able to

1. Understand different Conversion Devices.
2. Explain Biomass Pyrolysis.
3. Understand the working Principle of biomass gasification
4. Explain Biomass Combustion.
5. Know the application of Bio Gas.

****END****

(A30253) FUEL CELL TECHNOLOGY
(OPEN ELECTIVE)

B. Tech (EEE)

L	T	P	C
3	0	0	3

UNIT I: INTRODUCTION TO FUEL CELLS

Introduction – working and types of fuel cell – low, medium and high temperature fuel cell, liquid and methanol types, proton exchange membrane fuel cell solid oxide, hydrogen fuel cells – thermodynamics and electrochemical kinetics of fuel cells

UNIT II: FUEL CELLS FOR AUTOMOTIVE APPLICATIONS

Fuel cells for automotive applications – technology advances in fuel cell vehicle systems – onboard hydrogen storage – liquid hydrogen and compressed hydrogen – metal hydrides, fuel cell control system – alkaline fuel cell – road map to market.

UNIT III:
FUEL CELL COMPONENTS AND THEIR IMPACT ON PERFORMANCE

Fuel cell performance characteristics – current/voltage, voltage efficiency and power density, ohmic resistance, kinetic performance, mass transfer effects – membrane electrode assembly components, fuel cell stack, bi-polar plate, humidifiers and cooling plates.

UNIT IV: HYDROGEN STORAGE TECHNOLOGY

Hydrogen storage technology – pressure cylinders, liquid hydrogen, metal hydrides, carbon fibers – reformer technology – steam reforming, partial oxidation, auto thermal reforming – CO removal, fuel cell technology based on removal like bio-mass.

UNIT V: FUEL CYCLE ANALYSIS

Fuel Cycle Analysis – application to fuel cell and other competing technologies like battery powered vehicles, SI engine fueled by natural gas and hydrogen and hybrid electric vehicle.

REFERENCEBOOKS:

1. Fuel Cells for automotive applications – professional engineering publishing UK. ISBN 1- 86058 4233, 2004.

2. Fuel Cell Technology Handbook SAE International GregorHoogers CRC Press ISBN 0-8493-0877-1-2003.

Course Outcome:

After learning the course, the students should be able to:

1. Demonstrate the working of various types of fuel cells.
2. Make use of the fuel cell for automotive applications.
3. Compare the fuel cell performance characteristics.
4. Explain the concept of hydrogen storage systems
5. Analyze the fuel cycle

****END****

(A30255) ENERGY EFFICIENCY IN ELECTRICAL UTILITIES (OPEN ELECTIVE)

B. Tech (EEE)

L	T	P	C
3	0	0	3

UNIT I: ELECTRICAL SYSTEMS & ELECTRIC MOTORS

Introduction of Electrical systems, Tariff and economic considerations; T & D losses, Electrical load management; Maximum demand management, Role of Power factor and its improvement- Electric Power systems analysis -Energy Efficient Technologies in Electrical Systems - Motor Types, Characteristics, Efficiency - Energy Efficient Motors - Factors affecting Energy efficiency of a motor - Soft starters, Variable speed drives

UNIT II: COMPRESSED AIR SYSTEMS &HVAC

Introduction, Compressor types and performance; Compressed air syste ms components;
efficient operation of compressed air systems, Systems capacity assess ment
Energy conservation opportunities

UNIT III: REFRIGERATION SYSTEMS.

Introduction: Types of Refrigeration systems; Common Refrigerant an d Propertiescompressor types and applications Performance assessme nt of Refrigeration plants -Energy conservation opportunities

UNIT IV: FANS, PUMPING SYSTEMS AND COOLING TOWERS

Types, Performance evaluation, efficient system operation, Capacity selections - Performance assessment of fans and blowers - Energy conservation opportunities
Types, Performance evaluation, efficient system operation - Energy conservation opportunities in pumping systems - Introduction to cooling towers; cooling tower performance, efficient system operation- Energy conservation opportunities in cooling towers.

UNIT V: LIGHTING SYSTEMS

Basic terms of lighting systems; Lamp and Luminaries types, recommended illumination level-Methodology of lighting systems energy efficiency study - Cast study, Energy conservation opportunities

TEXT BOOKS

1. Capehart, Turner, Kennedy. Guide to Energy Management. Fifth Ed. The Fairmount Press, 2006.
2. Thumann, Younger. Handbook of Energy Audit. Sixth Ed. The Fairmount Press, 2003.
3. Thumann, Mehta. Handbook of Energy Engineering. Fifth Ed. The Fairmount Press, 2001

REFERENCES BOOKS

1. General Aspect of Energy Management and Energy Audit, 2010, BEE Guide book
2. Energy Efficiency in Thermal Utilities, 2010, BEE guide book
3. Energy Efficiency in Electrical Utilities, 2010, BEE guide book
4. Turner WC. Energy Management Handbook, 5th Edition, The Fairmont Press, 2005

Course Outcome:

After learning the course, the students should be able to:

1. Explain the energy efficient technologies meant for electrical systems
2. Examine the energy conservation opportunities in compressed air and HVAC systems
3. Assess the performance of refrigeration plants
4. Choose the appropriate energy efficient method for fanning, pumping, cooling, compressed air and refrigeration systems.
5. Analyze various efficient lighting systems and their energy conservation measures

END

(A30164) BASICS OF CIVIL ENGINEERING
(OPEN ELECTIVE)

B. Tech (EEE)	L	T	P	C
	3	0	0	3

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.Kandya, A. A., Elements of Civil Engineering, Charotar Publishing house

5.Mamlouk, M. S., and Zaniewski, J. P., Materials for Civil and Construction Engineering, Pearson Publishers.

Course Outcomes

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 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.

****END****

(A30165) SUSTAINABILITY CONCEPTS IN CIVIL ENGINEERING
(OPEN ELECTIVE)

B. Tech (EEE)	L	T	P	C
	3	0	0	3

UNIT – I

Introduction: Sustainability - Introduction, Need and concept of sustainability, Social-environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Environmental legislations in India - Water Act, Air Act.

UNIT – II

Global Environmental Issue: Resource degradation, Climate change, Regional and Local Environmental Issues. Carbon credits and carbon trading, carbon foot print Carbon sequestration – Carbon capture and storage (CCS). Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) - Scope and Goal, Bio-mimicking.

UNIT – III

Sustainable Design: Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification- GRIHA & IGBC Certification for buildings, Energy efficient building design- Passive solar design technique, Thermal storage, Cooling strategies, high performance insulation. Sustainable cities, Sustainable transport.

UNIT – IV

Clean Technology and Energy: Energy sources: Basic Concepts-Conventional and non-conventional, solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans, Geothermal energy. Rainwater harvesting.

UNIT – V

Green Engineering: Green Engineering concepts, Sustainable Urbanization, industrialization and poverty reduction; Social and technological change, Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis.

TEXTBOOKS:

1. Allen, D.T. and S honnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
2. Bradley. A.S; Adebayo, A. O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.

REFERENCE BOOKS:

1. Mackenthun, K. M. Basic Concepts in Environmental Management, Lewis Publication.
2. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency PublicationsRating System, TERI Publications - GRIHA Rating System.
3. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
4. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English
Language Book Society (ELBS).
5. Malcolm Dowden, Climate Change and Sustainable Development: Law, Policy and Practice.
6. Daniel A. Vallero and Chris Brasier, "Sustainable Design: The Science of Sustainability and Green Engineering", Wiley-Blackwell.
7. Sustainable Engineering Practice: An Introduction, Committee on Sustainability, American Society of Civil Engineers.

Course Outcomes:

After studying this course, students will be able to:

1. Able to understand the component of building with their function
2. Learn the sustainability concepts; understand the role and responsibility of engineers in sustainable development.
3. Quantify sustainability, and resource availability, Rationalize the sustainability based on scientific merits.
4. Understand and apply sustainability concepts in construction practices, designs, product developments and processes across various engineering disciplines.
5. Make a decision in applying green engineering concepts and become a lifelong advocate of sustainability in society.

****END****

(C30165) BASICS OF INSURANCE & TAXATION
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Unit I: Introduction to Life Insurance and General Insurance:
Introduction to Life Insurance - Principles of Life Insurance - Life insurance products, pensions and annuities, Introduction to General Insurance. Principles of General Insurance. Types of General Insurance - Personal general insurance products (Fire, Personal Liability, Motors, Miscellaneous Insurance). Terminology, clauses and covers.

Unit II:Claim Management & Re-Insurance:
Claim Management - Claim Settlement - Legal Framework - Third party Administration, Insurance ombudsman - Consumer Protection Act - Re-Insurance in Life Insurance - Retention Limits - Methods of Re-insurance.

Unit III: General Perspectives and Income Tax rate Structure:
Historical background of Taxation Laws in India, Fundamental Principles of Income Tax and concepts, Government Financial Policies regarding Taxation. Tax structure and its Role in Indian Economy, Residential Status, Non-Resident persons & Non-Ordinary Resident, Previous year and Assessment year Tax: Fees and cess, Capital Expenditure and Capital Income. Revenue Expenditure and Revenue Income, Tax Evasion and Tax Avoidance, Direct and Indirect Taxes.

Unit IV:
Heads and Sources of Income and Exemptions & Deductions under the Income Tax: Salary and Fringe Benefit Tax, Income from House Property, Income from Business; Profession or Vocation, Capital Gains, Income from other sources. (Theory only), Exemptions & Deductions under the Income Tax Act, Income exempt u/s 10 of the I.T. Act, Permissible deductions under Chapter VI of I.T. Act, Relief, Double Taxation Relief.

Unit V:
Assessment Procedures: PAN AND TAN, Filing of return and e-filling, Advance payment of Tax, Tax deduction at source, Tax

Collection at Source, Refund of Tax, and Types of Assessment. Computation of Income in Individuals

Text Books:

1. Mishra M.N: Insurance Principles and Practice; S.Chand and Co. New Delhi, 22nd Edition.
2. Principles of Life Insurance: Dr.Shrikrishan Laxman Karve, Himalaya, First Edition, 2017
3. Insurance: Theory & Practice: Tripathy& Pal, PHI, 2nd Edition, 2006
4. Taxation: H.Prem raja - Sri Hamsrala publications, 1/e
5. Direct Taxes Law & Practice with Supplement: Dr. V K Singhania, Taxman Publications, 64th Edition.
6. Gour and Narang - Income Tax Law and Practice, Kalyani Publication, 47th Edition, 2019.
7. Practicals in Taxation: H.Prem raja - Sri Hamsrala publications,1/e.
8. Income Tax: B.B. Lal, Pearson Education, 1st Edition, 2012

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Explain the basic legal concepts and general principles of Insurance sector.
2. Implement claim management and settlement.
3. Explain the importance of income tax and its structure
4. Analyze tax exemptions and deductions of income tax.
5. Prepare tax assessments, computation of individual Incomes

****END****

(C30166) BUSINESS ETHICS & CORPORATE GOVERNANCE (OPEN ELECTIVE)

B. Tech (EEE)

L	T	P	C
3	0	0	3

Unit I

Business Ethics The Changing Environment: Business Ethics-why does it matter?; Levels of Business Ethics-Five Myths about Business Ethics- Can Business Ethics be Taught and Trained?; stages of Moral development, Kohlberg's study- Carol Gilligan's Theory-Principles of Ethics.

Unit II

Professional Ethics. Introduction to Professional Ethics- Ethics in Production and Product Management-Ethics of Marketing Professionals-Ethics in HRM-Ethics of Finance and Accounting Professionals-Ethics of Advertisement-Ethics of Media Reporting-Ethics of Healthcare Services. Ethical Dilemma. Introduction, Dilemma and Ethical Dilemma-Mounting Scandals-Ethical Issues-Preparatory Ethics: Proactive steps-The software challenge.

Unit III

Cyber crimes and cyber Terrorism-social,Political, ethical and psycological , dimensitional , Intellectual properrty in the cyberspace,Ethical dimenstions of cyber crimes-the psycology, mindset & Skills of Hackers & Other cyber criminals, Sociology of cyber criminals, inforamtion Warfare.

Unit IV

Corporate Governance I: Does Good Governance Really matters to Corporations?-Importance of corporate Governance –Corporate Governance in India-Board Structures Processes and Evaluation-Director Independence –Board committees, Indian model of Corporate Governance.

Unit V

Corporate Governance-II: Information communication and Disclosure-Irani Committee Report-OECD Principles of Corporate Governance –Risk, Internal Control and Assurance-Banks and Corporate Governance.

Text Books:

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, 1st Edition, 2013.
3. A.C.Fernando: Corporate Governance, Principles, Policies and Practices, Pearson, 3rd Edition,2012.
4. C.S.V.Murthy: Business Ethics, Himalaya Publishing House, 2nd Edition, 2012.
5. N.Balasubramanian : Corporate Governance and Stewardship, TMH,4th Edition.
6. Nina Godbole & Sunit Belapure " Cyber Security" wiley india, 1st Edition, 2012.
7. Joseph W.Weiss : Business Ethics, Thomson, 4th Edition,2006.
8. Geethika,RK Mishra, Corporate Governance Theory and Practice,Excel, 1st Edition, 2011.
9. Dr.S.S.Khanka, Business Ethics and Corporate Governance, S.Chand, 1/e, 2013.
10. K.PraveenParboteeach, Business Ethics, Routledge, 2nd Edition, 2018.
11. Praveen B Malla, Corporate Governance, Routledge, 1st Edition, 2010.

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 Cyber crime and Cyber Terrorism.
4. Predict stakeholder's roles in corporate Governance.
5. Review committee Reports on development of Corporate Governance.

****END****

(A30477) FUNDAMENTALS OF EMBEDDED SYSTEMS (OPEN ELECTIVE)

B. Tech (EEE)	L	T	P	C
	3	0	0	3

Unit-I: Introduction to Embedded Systems
Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems

Unit-II: Typical Embedded System
Core of the Embedded System: General Purpose and Domain Specific Processors, Memory, ROM, RAM, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: On-board and External Communication Interfaces.

Unit-III: Embedded Firmware
Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

Unit - IV: RTOS Based Embedded System Design
Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Unit - V: Task Communication
Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization issues, Task Synchronization Techniques, Device Drivers

TEXT BOOK:

1. Introduction to Embedded Systems – Shibu K.V. McGraw Hill
2. Embedded Systems – Raj Kamal, TMH

REFERENCE BOOKS:

1. Embedded System Design – Frank Vahid, Tony Givargis, John Wiley.
2. Embedded Systems – Lyla, Pearson, 2013
3. An Embedded Software Primer- David E Simon, Pearson Education

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

1. Explain the basics of embedded systems and classify its applications
2. Compare various types of memories, sensors and Input / Output devices.
3. Discuss the embedded firmware for various applications.
4. Interpret the characteristics of Real time operating Systems
5. Illustrate the concepts of shared memory and task communications.

****END****

(A30478) SENSORS& TRANSDUCERS
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Unit – I:

Introduction: Definition, principle of sensing & transduction, classification. **Mechanical and Electromechanical sensor:** Resistive (potentiometric type): Forms, material, resolution, accuracy, sensitivity. Strain gauge: Theory, type, materials, design consideration, sensitivity, gauge factor, variation with temperature, adhesive, rosettes. Inductive sensor: common types- Reluctance change type, Mutual inductance change type, Magnetostrictive type, material, construction and input output variable, Ferromagnetic plunger type, short analysis.

Unit – II:

Capacitive sensors: variable distance-parallel plate type, variable area-parallel plate, serrated plate/teeth type and cylindrical type, variable dielectric constant type, calculation of sensitivity, Proximity sensor. Stretched diaphragm type: microphone, response characteristics. Piezoelectric element: piezoelectric effect, charge and voltage co-efficient, crystal model, materials, natural & synthetic type, their comparison, force & stress sensing, ultrasonic sensors.

Unit – III:

Thermal sensors: Resistance change type: RTD materials, tip sensitive & stem sensitive type, Thermistor material, shape, ranges and accuracy specification. Thermoemf sensor: types, thermoelectric power, general consideration, Junction semiconductor type IC and PTAT type. Radiation sensors: types, characteristics and comparison, Pyro electric type.

Unit – IV:

Magnetic sensors: Sensor based on Villari effect for assessment of force, torque, proximity, Wiedemann effect for yoke coil sensors, Thomson effect, Hall effect, and Hall drive, performance characteristics. Radiation sensors: LDR, Photovoltaic cells, photodiodes, photo emissive celltypes, materials, construction, response. Geiger counters, Scintillation detectors.

Unit – V:
Film Sensors: Thick film and thin film types, Electroanalytic sensors – Electrochemical cell, Polarization types, and membrane electrode types. Biosensors, Smart/Intelligent sensors, Nano-sensors, Nano-tube sensors, molecular and quantum sensors.

TEXT BOOKS:
1. Sensor & transducers, D. Patranabis, 2nd edition, PHI
2. Instrument transducers, H.K.P. Neubert, Oxford University press.
3. Measurement systems: application & design, E.A. Doebelin, McGraw Hill.

REFERENCE BOOKS:
1. Sensor and Transducers, Third Edition, Ian Sinclair, Newnes.
2. Sensor Technology, Hand Book, JON S. Wilson, Newnes.ELSEVIER.
3. Sensor and Transducers, Characteristics, Applications, Instrumentation, Interfacing, Second Edition, M.J. Usher and D.A. Keating, MACMILLAN Press Ltd.

COURSE OUTCOMES:
At the end of the course the student will be able to:
1. 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.

END

(A30358) INDUSTRIAL SAFETY ENGINEERING
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT-I:

Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.

UNIT-II:

Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT-III:

Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.

UNIT-IV:

Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault-finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT-V:

Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

TEXT BOOKS

1. Mobley, R. Keith, Lindley R. Higgins, and Darrin J. Wikoff. *Maintenance Engineering Handbook*. New York, NY: Mcgraw-Hill, 2008.
2. Garg, H. P. *Industrial Maintenance*. S Chand, 1976.

REFERENCE BOOKS:

1. Graham, F. D. "Audels Pumps, Hydraulics and Air Compressors. Theo." (1998).
2. Winterkorn, Hans F., and Hsai-Yang Fang. *Foundation engineering handbook*. Springer, Boston, MA, 1991.

Course Outcomes:

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

1. Understand various hazards and their prevention.
2. Apply maintenance techniques to various equipments.
3. Understand types of wear and corrosions and their prevention.
4. Explain fault tracing and its applications.
5. Apply periodic and preventive maintenance techniques to various equipments.

****END****

(A30360) WORK SYSTEM DESIGN
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

Unit-I

Work System Design: Introduction and Concept of Productivity, Measurement of Productivity, Productivity Measures, Productivity Measurement Models, Factors Influencing Productivity, Causes of Low Productivity, Productivity Measurement Models, Productivity Improvement Techniques, Numerical Problems on productivity, Case study on productivity.

Unit-II

Work Study: Basic Concept, Steps Involved in Work Study, Concept of Work Content, Techniques of Work Study, Human Aspects of Work Study.

Method Study: Basic Concept, Steps Involved in Method Study, Recording Techniques, Operation Process Charts, Operation Process Charts: Examples.

Flow Process Charts, Flow Process Charts: Examples, Two-Handed-Process Charts, Multiple Activity Charts, Flow Diagrams.

Unit-III

String Diagrams, Principles of Motion Economy, Micro-Motion Study, Therbligs, SIMO Charts, Memo-Motion Study, Cycle graph and Chrono-Cycle Graph, Critical Examination Techniques, Development and Selection of New Method, Installation and Maintenance of Improved Methods.

Unit-IV

Work Measurement: Basic Concept, Techniques of Work Measurement, Steps Involved in Time Study, Steps and Equipment of Time Study,

Performance Rating: Examples, Allowances, Computation of Standard Time-I, Computation of Standard Time-II, Case Study

Unit-V

Work Sampling: Basics, Procedure of Work Sampling Study, Numerical Problems on work sampling, Introduction to Synthetic Data and PMTS, Introduction to MTM and MOST

Ergonomics: Basic Concept, Industrial Ergonomics, Anthropometry, Man-Machine System-1, Man-Machine System-2

TEXT BOOKS:

1. Introduction to Work Study: International Labor Office (ILO), Geneva.
2. Motion and Time Study Design and Measurement of Work: Ralph M. Barnes, Wiley, The University of California.
3. Industrial Engineering and Production Management: M. Telsang, S. Chand and Company Ltd.

Course Outcomes:
At the end of the course, the student should be able to

1. Calculate the basic work content of a specific job for employees of an organization. Thereby they will be able to calculate the production capacity of man power of an organization.
2. Analyze and calculate the level of risk in a job causing stress, fatigue and musculoskeletal disorders and design appropriate work systems.
3. Rate a worker engaged on a live job and calculate basic, allowed and standard time for the same.
4. Analyze the existing methods of working for a particular job and develop an improved method through questioning technique.
5. devise appropriate wage and incentive plan for the employees

****END****

(A30256) ENERGY AUDIT & CONSERVATION
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT I: Basic Principles of Energy Audit

Energy audit- definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit.

UNIT II: Energy Management

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting- Energy manger, Qualities and functions, language, Questionnaire – check list for top management.

UNIT III: Energy Efficient Motors

Energy efficient motors, factors affecting efficiency, loss distribution, constructional details, characteristics – variable speed, variable duty cycle systems, RMS hp- voltage variation-voltage unbalance- over motoring- motor energy audit

UNIT IV: Power Factor Improvement, Lighting and Energy Instruments

Power factor – methods of improvement, location of capacitors, pf with non-linear loads, effect of harmonics on power factor, power factor motor controllers – Good lighting system design and practice, lighting control, lighting energy audit – Energy Instruments- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers, application of PLC’s.

UNIT V: Economic Aspects and Analysis

Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method, replacement analysis, life cycle costing analysis- Energy efficient motors- calculation of simple payback method, net present worth method- Power factor correction, lighting – Applications of life cycle costing analysis, return on investment.

TEXT BOOKS:

1. Energy management by W.R. Murphy AND G. Mckay Butter worth, Heinemann publications.
2. Energy management by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998

REFERENCES:

1. Energy efficient electric motors by John.C. Andreas, Marcel Dekker Inc Ltd-2nd edition, 1995-
2. Energy management hand book by W.C. Turner, John wiley and sons
3. Energy management and good lighting practice: fuel efficiency- booklet 12-EEO

Course Outcomes

On completion of the course, students will be able to

1. Explain the various methods of energy audit.
2. Illustrate the energy management strategies.
3. Perform energy audit in energy efficient motors
4. Relate the energy conservation with the improvement in energy efficiency and power factor.
5. Analyze the economic aspects to be considered in energy usage

****END****

(A30257) NANO TECHNOLOGY
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

UNIT I: NTRODUCTION

History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects.

UNIT II: UNIQUE PROPERTIES OF NANOMATERIALS

Microstructure and Defects in Nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple and declinations, Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility. Magnetic Properties: Soft magnetic nano crystalline alloy, Permanent magnetic nano-crystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

UNIT III: SYNTHESIS ROUTES

Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method, Self-assembly, Top down approaches: Mechanical alloying, Nano-lithography, Consolidation of Nanopowders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing, Spark plasma sintering.

UNIT IV: TOOLS TO CHARACTERIZE NANO MATERIALS

X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nanoindentation.

UNIT V: APPLICATIONS OF NANOMATERIALS

Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, WaterTreatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Défense and Space Applications, Concerns and challenges of Nanotechnology.

TEXT BOOKS:

1. Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.
2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

REFERENCES BOOKS:

1. Nano: The Essentials by T. Pradeep, Mc Graw- Hill Education.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek.
3. Transport in Nano structures- David Ferry, Cambridge University press 2000
4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S., S. R. Kumar, J. H. Carola.
5. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University press

Course Outcomes

On completion of the course, students will be able to

1. Classify nanostructured materials
2. Illustrate the characteristics and properties of nano-materials.
3. Identify the synthesis routes of nano-materials
4. Make use of the tools to characterize the nano-materials.
5. Utilize the nano-materials for various applications

****END****

(A30166) ENVIRONMENTAL PROTECTION AND MANAGEMENT
(OPEN ELECTIVE)

B. Tech (EEE)

L	T	P	C
3	0	0	3

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. Students are able to understand the meaning of environmental management.
2. Students are also able to understand the importance of environmental management
3. Development of society and country. It also explains how we can use natural resources in sustainable manner.
4. After completion of the course students will have knowledge of various acts and laws and will be able to identify the industries that are violating these rules
5. Students are able to understand importance of environmental rules for development of society

****END****

(A30167) ALTERNATE BUILDING MATERIALS
(OPEN ELECTIVE)

B. Tech (EEE)	L	T	P	C
	3	0	0	3

UNIT – I

Introduction: Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle energy, Global warming and construction industry, Green concepts in buildings, Green building ratings – IGBC and LEED manuals – mandatory requirements, Rainwater harvesting & solar passive architecture. Environmental friendly and cost-effective building technologies, Requirements for buildings of different climatic regions.

UNIT – II

Elements of Structural Masonry: Elements of Structural Masonry, Masonry materials, requirements of masonry units' characteristics of bricks, stones, clay blocks, concrete blocks, stone boulders, laterite Blocks, Fal- G blocks and Stabilized mud block. Manufacture of stabilized blocks.

Structural Masonry Mortars: Mortars, cementations materials, sand, natural & manufactured, types of mortars, classification of mortars as per BIS, characteristics and requirements of mortar, selection of mortar. Uses of masonry, masonry bonding, Compressive strength of masonry elements, Factors affecting compressive strength, Strength of Prisms/wallets and walls, Effect of brick bond on strength, Bond strength of masonry: Flexure and shear, Elastic properties of masonry materials and masonry, Design of masonry compression elements subjected to axial load.

UNIT – III

Alternate Building Materials: Lime, Pozzolana cements, Raw materials, Manufacturing process, Properties and uses. Fibers- metal and synthetic, Properties and applications. Fiber reinforced plastics, Matrix materials, Fibers organic and synthetic, Properties and applications. Building materials from agro and industrial wastes, Types of agro wastes, Types of industrial and mine wastes, Properties and applications. Masonry blocks using industrial wastes. Construction and demolition wastes.

UNIT – IV

Alternate Building Technologies: Use of arches in foundation, alternatives for wall constructions, composite masonry, confined masonry, cavity walls, rammed earth, Ferro cement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications. Top down construction, Mivan Construction Technique. Alternate Roofing Systems: Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes

UNIT – V

Equipment for Production of Alternate Materials: Machines for manufacture of concrete, Equipments for production of stabilized blocks, Moulds and methods of production of precast elements, Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using alternatives.

TEXTBOOKS:

1. KS Jagadish, B V Venkatarama Reddy and K S Nanjunda Rao, “Alternative Building Materials andTechnologies”, New Age International pub.
2. Arnold W Hendry, “Structural Masonry”, Macmillan Publishers.

REFERENCE BOOKS:

1. RJS Spence and DJ Cook, “Building Materials in Developing Countries”, Wiley
pub.
2. LEED India, Green Building Rating System, IGBC pub.
3. IGBC Green Homes Rating System, CII pub.
4. Relevant IS Codes.

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

1. Principle of building planning and by laws and standards of building material Components and orientation of the building.
2. Solve the problems of Environmental issues concerned to building materials and cost effective building technologies
3. Select appropriate type of masonry unit and mortar for civil engineering constructions; also they are able to Design Structural Masonry Elements under Axial Compression.

4. Analyse different alternative building materials which will be suitable for specific climate and in an environmentally sustainable manner. Also capable of suggesting suitable agro and industrial wastes as a building material.
5. Recommend various types of alternative building materials and technologies and design a energy efficient building by considering local climatic condition and building material.

****END****

(C30167) MARKETING MANAGEMENT
(OPEN ELECTIVE)

B. Tech (EEE)	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**

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. Philip Kotler, Gray Armstrong, Principles of Marketing, 15e, Pearson Education, 2016.
2. Lamb, Hair, Sharma, Mc Daniel, Principles of Marketing, A South Asian Perspective Cengage Learning, 11/e, 2016.
3. RajanSaxena, Marketing Management, 3e, Tata Mc Graw Hill, 2012.

4. Kenneth E Clow, Donald Baack, Cases in Marketing Management, Sage South Asia edition, 2012.
5. Adrian Palmer: Introduction to Marketing, Theory and Practice, 2nd Edition, Oxford, 2011.
6. S. Neelamegham, Marketing in India text & cases, 4th edition, Vikas, 2013.
7. 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. Outline Segmentation, targeting and Positioning Goods and Services in Market.
3. Develop conceptual knowledge on consumer behavior, Marketing Mix and Promotional mix elements
4. Illustrate marketing channels of distribution
5. Analysing sales management and skills of sales manager.

****END****

(C30168) INTELLECTUAL PROPERTY RIGHTS
(OPEN ELECTIVE)

	L	T	P	C
B. Tech (EEE)	**3**	**0**	**0**	**3**

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 secretes 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, 5th Edition.
2. Intellectual property right - Unleashing the knowledge economy, PrabuddhaGanguli, Tata Mc Graw Hill Publishing Company Ltd., 1st Edition.

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.

END