CMR COLLEGE OF ENGINEERING& TECHNOLOGY

(UGC Autonomous)

Kandlakoya, Medchal Road, Hyderabad – 501 401

ACADEMIC REGULATIONS - R 22

FOR CBCS & OUTCOME BASED B.TECH (REGULAR, HONOURS and MINOR) PROGRAMMES

(**Effective for the students admitted into I year from the Academic Year 2022-23**)

1.0 Under-Graduate Degree Programme in Engineering & Technology (UGP in E&T)

CMR College of Engineering & Technology, Hyderabad offers 4 Years (8 Semesters) Bachelor of Technology (B.Tech.) Regular, Honours and Minor degree Programmes, under Choice Based Credit System (CBCS), with effect from the Academic Year 2022-23 and onwards, in the Branches of Engineering.

2.0 Eligibility for Admission

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

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

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

2.4 Lateral Entry seats for 10% 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 instructions for the entire undergraduate programme in Engineering & Technology will be **English** only

3.0 B.Tech. Programme Structure

3.1 A student after securing admission shall complete the B.Tech. programme in a minimum period of **four** academic years (8 semesters), and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Tech course. Each student shall secure 160 credits (with CGPA $\geq$ 5) required for the completion of the undergraduate programme and award of the B.Tech. degree.

3.2 **UGC/ AICTE** specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms, which are listed below.

3.2.1 Semester Scheme

Each undergraduate programme is of 4 academic years (8 semesters) with the academic year divided into two semesters (First/Odd and Second/Even). Each Semester shall have a minimum of 90 Instructional Days.

semester - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)' under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) indicated by UGC, and curriculum/course structure suggested by AICTE are followed.

3.2.2 Credit Courses

All subjects/ courses are to be registered by the student in a semester to earn credits which shall be assigned to each subject/ course in an L: T: P: C (lecture periods: tutorial periods: practical periods: credits) structure based on the following general pattern.

- One credit for one hour/ week/ semester for Theory/ Lecture (L) courses or Tutorials.
- One credit for two hours/ week/ semester for Laboratory/ Practical (P) courses.

Courses like Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization Lab are mandatory courses. These courses will not carry any credits.

3.2.3 Subject Course Classification

All subjects/ courses offered for the undergraduate programme in E&T (B.Tech. degree programmes) are broadly classified as follows. The University has followed almost all the guidelines issued by AICTE/UGC.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BSC – Basic Sciences	Includes Mathematics, Physics and Chemistry subjects
2		ESC - Engineering Sciences	Includes Fundamental Engineering Subjects
3		HSMC – Humanities andSocial Sciences	Includes subjects related to Humanities, Social Sciences and Management
4	Core Courses (CoC)	PCC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.
5	Elective Courses (EℓC)	PEC – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
6		OEC – Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering.

7	Core Courses (PROJ)	Project Work	B.Tech. Project or UG Project or UG Major Project or Project Stage I & II
8		Industry Training/ Internship/ Mini-project/ Mini- Project/ Skill Development Courses	Industry Training/ Internship/ Mini-Project/ Mini-Project/ Skill DevelopmentCourses
9		Seminar	Seminar/ Colloquium based on core contents related to parent discipline/ department/ branch of Engineering.
10	Minor Courses	-	1 or 2 Credit Courses (subset of HSMC)
11	Mandatory Courses (MC)	-	Mandatory Courses (non-credit)

4.0 Course Registration

4.1 A 'faculty advisor or counselor' shall be assigned to a group of 20 students, who will advise the students about the undergraduate programme, its course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.

4.2 The academic section of the college invites 'registration forms' from students before the beginning of the semester through 'on-line registration', ensuring 'date and time stamping'. The online registration requests for any 'current semester' shall be **completed before the commencement of SEEs (Semester End Examinations) of the 'preceding semester'**.

4.3 A student can apply for **on-line** registration, **only after** obtaining the '**written approval**' from faculty advisor/counselor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with the Head of the Department, Faculty Advisor/ Counselor and the student.

4.4 A student may be permitted to register for all the subjects/ courses in a semester as specified in the course structure with maximum additional subject(s)/course(s) limited to 6 Credits (any 2 elective subjects), based on **progress** and SGPA/ CGPA, and completion of the '**pre-requisites'** as indicated for various subjects/ courses, in the department course structure and syllabus contents.

4.5 Choice for '**additional subjects/courses**', not more than any 2 elective subjects in any Semester, must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/Mentor/HOD.

4.6 If the student submits ambiguous choices or multiple options or erroneous entries during **online** registration for the subject(s) / 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.

4.7 Subject/ course options exercised through **on-line** registration are final and **cannot** be changed or inter-changed; further, alternate choices also will not be considered. However, if the subject/ course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any inevitable or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within **a week** after the commencement of class-work for that semester.

4.8 Dropping of subjects/ courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor 'within a period of 15 days' from the beginning of the current semester.

4.9 **Open Electives**: The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by his own (parent) department, if the student has not registered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat/should not match with any category (Professional Core, Professional Electives, Mandatory Courses etc.) of subjects even in the forthcoming semesters.

4.10 **Professional Electives**: The students have to choose six Professional Electives (PE-I to VI) from the list of professional electives given.

5.0 Subjects/ courses to be offered

5.1 A subject/ course may be offered to the students, **only if** a minimum of 15 students opt for it.

5.2 More than **one faculty member** may offer the **same subject** (lab/ practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection of 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).

5.3 If more entries for registration of a subject come into picture, then the Head of the Department concerned shall decide, whether or not to offer such a subject/ course for **two (or multiple) sections**.

5.4 In case of options coming from students of other departments/ branches/ disciplines (not considering **open electives**), first **priority** shall be given to the student of the '**parent department**'.

6.0 Attendance requirements:

6.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects/ courses (including attendance in mandatory courses and Additional courses if any) for that semester.**Two periods** of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject.

6.2 Shortage of attendance in aggregate upto 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.

6.3 A stipulated fee shall be payable for condoning of shortage of attendance.

6.4 Shortage of attendance below 65% in aggregate shall in **NO** case be condoned.

6.5 **Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled,** including all academic credentials (internal marks etc.) of that semester. **They will not be promoted to the next semester**. They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered; 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 inlater semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

6.6 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

7.0 Academic Requirements

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in Item No. **6**.

7.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% (14 marks out of 40 marks) in the Continuous Internal Evaluation (CIE), not less than 35% (21 marks out of 60 marks) in the semester end examinations (SEE), and a minimum of 40% (40 marks out of 100 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 **'C'** grade or above in that subject/ course.

7.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-time Research Project (or) Field Based Research Project (or) Mini Project (or) Internship (or) Technical Seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student isdeemed to have failed, if he (i) does not submit a report on Mini Project/Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-time ResearchProject (or) Field Based Research

Project (or) Mini Project (or) Internship (or) Technical Seminar evaluations.

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

7.3 Promotion Rules

S. No.	Promotion	Conditions to be fulfilled
1	**First year first semester to first year second semester**	**Regular course of study of first year first semester.**
2	**First year second semester to Second year first semester**	**(i) Regular course of study of first year second semester.** **(ii) Must have secured at least 20 credits out of 40 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**
3.	**Second year first semester to Second year second semester**	**Regular course of study of second year first semester.**
4	**Second year second semester to Third year first semester**	**(i) Regular course of study of second year second semester.** **(ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**
5	**Third year first semester to Third year second semester**	**Regular course of study of third year first semester.**
6	**Third year second semester to Fourth year first semester**	**(i) Regular course of study of third year second semester.** **(ii) Must have secured at least 72 credits out of 120 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**

7	**Fourth year first semester to Fourth year second semester**	**Regular course of study of fourth year first semester.**

7.4 A student (i) shall register for all courses/subjects covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA ≥ 5.0 (in each semester), and CGPA ≥ 5 (at the end of 8 semesters), (iv) **secured satisfactory grade in all the mandatory courses,** to successfully complete the undergraduate programme. The performance of the student in these 160 credits shall be considered for the calculation of the final CGPA **(at the end of undergraduate programme),** and shall be indicated in the consolidated grade cum credit sheet.

7.5 If a student registers for '**extra subjects'** (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 '**extra subjects**' (although evaluated and graded using the same procedure as that of the required 160 credits) will not be considered while calculating the SGPA and CGPA. For such '**extra subjects'** registered, percentage of marks and letter grade alone will be indicated in the grade card / marks memo as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations Items 6 and 7.1 – 7.4 above.

7.6 A student eligible to appear in the semester end examination for any subject/ course, but absent from it or failed (thereby failing to secure **'C'** grade or above) may reappear for that subject/ course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject/ course will be carried over, and added to the marks to be obtained in the SEE supplementary examination for evaluating performance in that subject.

7.7 A student **detained in a semester due to shortage of attendance may be re-admitted in the same semester in the next academic year for fulfillment of academic requirements**. The academic regulations under which a student has been re-admitted shall be applicable. Further, no grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which the student has been detained.

7.8 A student detained **due to lack of credits, shall be promoted to the next academic year only after acquiring the required number of academic credits.** The academic regulations under which the student has been readmitted shall be applicable to him.

8.0 Evaluation - Distribution and Weightage of Marks

8.1 The performance of a student in every subject/course (including practicals and Project Stage – I & II) will be evaluated for 100 marks each, with 40 marks allotted for CIE (Continuous Internal Evaluation) and 60 marks for SEE (Semester End-Examination).

8.2 In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each Mid-Term examination consists of two parts i) **Part – A** for 10 marks, ii) **Part – B** for 20 marks with a total duration of 2 hours as follows:

1. Mid Term Examination for 30 marks:
   a. Part - A : Objective/quiz/short answer paper for 10 marks.
   b. Part - B : Descriptive paper for 20 marks.

The objective/quiz/short answer paper is set with multiple choice, fill-in the blanks, match the following type of questions and short answer questions for a total of 10 marks (10 questions). The descriptive paper shall contain6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks. The **average of the two Mid Term Examinations** shall be taken as the final marks for Mid Term Examination (for 30 marks).

The remaining 10 marks of Continuous Internal Evaluation are distributed as:

2. Assignment for 5 marks. (**Average of 2 Assignments** each for 5 marks)
3. Subject Viva-Voce/PPT/Poster Presentation/ Case Study/quiz on a topic in the concerned subject for 5 marks.

While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus.

Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the subject concerned for 5 marks before II Mid-Term Examination.

- The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Over all 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

There is NO Computer Based Test (CBT)/onetime improvement test of mid examinations for R22 regulations.

The details of the end semester question paper pattern are as follows:

8.2.1 The semester end examinations (SEE), for theory subjects, will be conducted for 60 marks consisting of two parts viz. i) **Part- A** for 10 marks, ii) **Part - B** for 50 marks.

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from each unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.
- The duration of Semester End Examination is 3 hours.

8.3 For practical subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination. Out of the 40 marks for internal evaluation:

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks
2. **10 marks for viva-voce (**or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.
4. The remaining 10 marks are for Laboratory Project, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

The Semester End Examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the cluster / other colleges which will be decided by the examination branch of the University.

In the Semester End Examination held for 3 hours, total 60 marks are divided and allocated as shown below:

1. 10 marks for write-up
2. 15 for experiment/program
3. 15 for evaluation of results
4. 10 marks for presentation on another experiment/program in the same laboratory course and
5. 10 marks for viva-voce on concerned laboratory course.

- The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Over all 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks),

his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

8.4 The evaluation of courses having ONLY internal marks in I Year I Semester and II Year II Semester is as follows:

1. I Year I Semester course **(*ex., Elements of CE/ME/EEE/ECE/CSE etc*):** The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

   For CSE/IT and allied branches the Continuous Internal Evaluation (CIE) will be for 50 marks. Each Mid-Term examination consists of two parts i) Part – A for 20 marks, ii) Part – B for 20 marks with a total duration of 2 hours.

   Part A: Objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 20 marks.

   Part B: Descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks.

   The remaining 10 marks of Continuous Internal Evaluation are for Assignment (5 marks) and Subject Viva-Voce/PPT/Poster Presentation/ Case Study (5 marks) and the evaluation pattern will remain same as for other theory subjects.

   For all other branches, the Continuous Internal Evaluation (CIE) will be for 50 marks. Out of the 50 marks for internal evaluation:

   a) **A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks.**

   b) **10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.**

   c) **Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 15 marks.**

   d) **The remaining 15 marks are for Laboratory Report/Project and Presentation, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.**

2. II Year II Semester *Real-Time (or) Field-based Research Project* course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student

is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (ii) secures less than 40% marks in this course.

8.5 There shall be Industry training (or) Internship (or) Mini-project (or) Skill Development Courses (or) Paper presentation in reputed journal in collaboration with an industry of their specialization. Studentsshall register for this immediately after II-Year II Semester Examinations and pursue itduring summer vacation/semester break & during III Year without effecting regular course work. Internship at reputed organization (or) Skill development courses (or) Paper presentation in reputed journal (or) Mini Project shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination. It shall be evaluated for 100 external marks. The committee consists of an External Examiner, Head of the Department, Supervisor of the Mini Project (or) Internship etc, Internal Supervisor and a SeniorFaculty Member of the Department. There shall be **NO internal marks** for Industry Training (or) Internship (or) Mini-Project (or) Skill Development Courses (or) Paper Presentation in reputed journal.

8.6 There shall be a **Technical Seminar** presentation in the VIII Semester. For the Technical Seminar, the student shall collect the information on a specialized topic related to his branch other than the Real-Time (or) Field-based Research Project/ Mini project/ Internship/ 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 supervisor and a senior faculty member from the department. The Technical Seminar will be evaluated for 100 marks.

8.7 The UG project shall be initiated at the end of the IV Year I Semester and the duration of the project work is one semester. The student must present Project Stage – I during IV Year I Semester before II Mid examinations, in consultation with his Supervisor, the title, objective and plan of action of his Project work to the departmental committee for approval before commencement of IV Year II Semester. Only after obtaining the approval of the departmental committee, the student can start his project work.

8.8 UG project work shall be carried out in two stages: Project Stage – I for approval of project before Mid-II examinations in IV Year I Semester and Project Stage – II during IV Year II Semester. Student has to submit project work report at the end of IV Year II Semester. The project shall be evaluated for 100 marks before commencement of SEE Theory examinations.

8.9 For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall approve the project work to begin before II Mid-Term examination of IV Year I Semester. The student is deemed to be not eligible to register for the Project work, if he does not submit a report on Project Stage - I or does not make a presentation of the same before the evaluation

committee as per schedule.

A student who has failed may reappear once for the above evaluation, when it is 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.

8.10 For Project Stage – II, the external examiner shall evaluate the project work for 60 marks and the internal project committee shall evaluate it for 40 marks. Out of 40 internal marks, the departmental committee consisting of Head of the Department, Project Supervisor and a Senior Faculty Member shall evaluate the project work for 20 marks and Project Supervisor shall evaluate for 20 marks. The topics for Mini Project/ Internship/SDC etc. and the main Project shall be different fromthe topic already taken. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the External Examiner as per schedule, or (iii) secures less than 40% marks in the sum totalof the CIE and SEE taken together.

For conducting viva-voce of project, The External Examiner shall be nominated by the Controller of Examinations from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the HoD.

A student who has failed, may reappear once for the above evaluation, when it is scheduled again; if student 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.

8.11 A student shall be given only one time chance to re-register for a maximum of two subjects in a semester:

- If the internal marks secured by a student in the Continuous Internal Evaluation marks for 40 (Sum of average of two mid-term examinations consisting of Objective & descriptive parts, Average of two Assignments & Subject Viva-voce/PPT/ Poster presentation/ Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects.

A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the class work in next academic year.

In the event of the student taking this chance, his Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

8.12 For mandatory courses, a student has to secure 40 marks out of 100 marks (i.e. 40% of the 100 marks allotted) in the Continuous Internal Evaluation for passing the subject/course.

8.13 No marks or letter grades shall be allotted for mandatory/non-credit courses. Only Pass/Fail shall be indicated in Grade Card.

9.0 Grading Procedure

9.1 Grades will be awarded to indicate the performance of students in each Theory Subject, Laboratory/Practicals/ Mini Project/Internship/SDC and Project Stage. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.

9.2 As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	O (Outstanding)	10
80 and less than 90%	A^+ (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B^+ (Good)	7
50 and less than 60%	B (Average)	6
40 and less than 50%	C (Pass)	5
Below 40%	F (FAIL)	0
Absent	Ab	0

9.3 A student who has obtained an '**F'** grade in any subject shall be deemed to have '**failed'** and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

9.4 To a student who has not appeared for an examination in any subject, '**Ab'** grade will be allocated in that subject, and he is deemed to have '**Failed'**. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.

9.5 A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

9.6 A student earns Grade Point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding 'Credit Points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

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

9.7 A student passes the subject/ course only when **GP ≥ 5 ('C' grade or above)**

9.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (ΣCP) secured from all subjects/ 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

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

where 'i' is the subject indicator index (considering all subjects in a semester), 'N' is the no. of subjects '**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} subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} subject.

9.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in **all** registered courses (of 160) 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 II semester onwards at the end of each semester as per the formula

$$\textbf{CGPA} = \{ \sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \} \textbf{ … for all S semesters registered}$$

(i.e., up to and inclusive of S semesters, S ≥ 2),

where '**M'** is the **total** no. of subjects (as specifically required and listed under the course structure of the parent department) the student has '**registered'** i.e., from the 1^{st} semester onwards up to and inclusive of the 8^{th} semester, 'j' is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the no. of credits allotted to the j^{th} subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of I year I semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course/Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	2	C	5	2 x 5 = 10
Course 4	3	B	6	3 x 6 = 18
Course 5	1	A+	9	1 x 9 = 9
Course 6	1	C	5	1 x 5 = 5
Course 7	1	O	10	1 x 10 = 10

Course 8	2	A	8	2 x 8 = 16
Course 9	1	B^+	7	1 x 7 = 7
Course 10	1	B^+	7	1 x 7 = 7
	20			154

SGPA = 154/20 = 7.7

Illustration of Calculation of CGPA up to 3rd Semester:

Semester	Course/ Subject Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	Credit Points (CP)
I	Course 1	4	A	8	32
I	Course 2	4	O	10	40
I	Course 3	2	B	6	12
I	Course 4	3	A	8	24
I	Course 5	1	A+	9	9
I	Course 6	1	C	5	5
I	Course 7	1	B	6	6
I	Course 8	2	A	8	16
I	Course 9	1	C	5	5
I	Course 10	1	O	10	10
II	Course 11	2	B+	7	14
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
II	Course 15	1	A	8	8
II	Course 16	1.5	C	5	7.5
II	Course 17	1.5	O	10	15
II	Course 18	1.5	B+	7	10.5
II	Course 19	1.5	B	6	9
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
III	Course 22	3	A	8	24
III	Course 23	3	O	10	30
III	Course 24	3	A	8	24
III	Course 25	2	C	5	10
III	Course 26	1	O	10	10
III	Course 27	1	B+	7	7
	Total Credits	**60**		**Total Credit Points**	**467**

CGPA = 467/60 = 7.78

The calculation process of CGPA illustrated above will be followed for each subsequent

semester until 8th semester. The CGPA obtained at the end of 8th semester will become the final CGPA secured for entire B.Tech. programme.

9.10 For merit ranking or comparison purposes or any other listing, **only** the '**rounded off'** values of the CGPAs will be used.

9.11 SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester. However, mandatory courses will not be taken into consideration.

10.0 Passing Standards

10.1 A student shall be declared successful or 'passed' in a semester, if he secures a GP ≥ 5 (**'C'** grade or above) in every subject/course in that semester (i.e. when the student gets an SGPA ≥ 5.0 at the end of that particular semester); and he shall be declared successful or 'passed' in the entire undergraduate programme, only when gets a CGPA ≥ 5.00 (**'C'** grade or above) for the award of the degree as required.

10.2 After the completion of each semester, a grade card or grade sheet 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.) and credits earned. **There is NO exemption of credits in any case.**

11.0 Declaration of results

11.1 Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

11.2 For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

% of Marks = (final CGPA – 0.5) x 10

12.0 Award of Degree

12.1 A student who registers for all the specified subjects/ courses as listed in the course structure 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 B.Tech. degree in the branch of Engineering selected at the time of admission.

12.2 A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.

12.3 A student with final CGPA (at the end of the undergraduate programme) ≥ 8.00, and fulfilling the following conditions - shall be placed in '**First Class with Distinction'**. However, he

(i) Should have passed all the subjects/courses in '**First Appearance'** within the first 4 academic years (or 8 sequential semesters) from the date of

commencement of first year first semester.

(ii) Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.

A student not fulfilling any of the above conditions with final CGPA ≥ 8 shall be placed in **'First Class'.**

12.4 Students with final CGPA (at the end of the undergraduate programme) ≥ 7.0 but < 8.00 shall be placed in **'First Class'.**

12.5 Students with final CGPA (at the end of the undergraduate programme) ≥ 6.00 but < 7.00, shall be placed in '**Second Class'**.

12.6 All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the undergraduate programme) ≥ 5.00 but < 6, shall be placed in '**pass class**'.

12.7 A student with final CGPA (at the end of the undergraduate programme) < 5.00 will not be eligible for the award of the degree.

12.8 Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of '**Gold Medal**'.

12.9 Award of 2-Year B.Tech. Diploma Certificate

1. A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) upto B.Tech. II Year II Semester, if the student want to exit the 4-Year B.Tech. program and *requests for the 2 -Year* B. Tech. (*UG) Diploma Certificate.*

2. The student **once opted and awarded 2-Year UG Diploma Certificate, thestudent will be permitted to join** in B. Tech. III Year I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree ONLY in the next academic year along with next batch students. *However, if any student wishes to continue the study after opting for exit, he/she should register for the subjects/courses in III Year I Semester before commencement of classwork for that semester.*

3. The students, who exit the 4-Year B. Tech. program after II Year of study and wish to re-join the B.Tech. program, must submit the 2 -Year B. Tech. (*UG) Diploma Certificate awarded to him, subject to the eligibility for completion of Course/Degree.*

4. A student may be permitted to take one year break after completion of II Year II Semester or B. Tech. III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

13.0 Withholding of results

13.1 If the student has not paid the fees to the College at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and the student 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.

14.0 Transitory Regulations

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of R18 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R22 Regulations and he 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.
2. A student who has been detained in any semester of II to VIII semesters of R18 regulations for want of attendance, shall be permitted to join the corresponding semester of R22 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 R22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

B. For students detained due to shortage of credits:

3. A student of R18 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of R22 Regulations only after acquiring the required number of 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. The R22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in R22 Regulations:

4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R22 Regulations. **There is NO exemption of credits in any case**.
6. If a student is readmitted to R22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R22 Regulations will be substituted by another subject to be suggested by the Board of Studies.
7. The total credits required are 160 including both R18 & R22 regulations, and if the total credits are less than 160 including both R18 & R22 Regulations then an additional course(s) suggested by the Board of Studies may be given to fulfill the

minimum requirements of 160 credits.

Note: If a student readmitted to R22 Regulations and has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in R22 Regulations, the remedial classes shall be conducted to cover those subjects/topics for the benefit of the students.

15.0 Student Transfers

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

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

15.3 The students seeking transfer to colleges affiliated to JNTUH from various other Universities/institutions have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the students have not studied at the earlier institution. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the students have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.

15.4 The transferred students from other Universities/Institutions to JNTUH affiliated colleges who are on rolls are to be provided one chance to write the CBT (for internal marks) in the equivalent subject(s) as per the clearance letter issued by the University.

15.5 The autonomous affiliated colleges have to provide one chance to write the internal examinations in the equivalent subject(s) to the students transferred from other universities/institutions to JNTUH autonomous affiliated colleges who are on rolls, as per the clearance (equivalence) letter issued by the University.

16.0 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 Principal/College Academic Council/Honourable Vice-Chancellor of JNTUH is final.

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

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ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME)

(Applicable for the students admitted into II Year B.Tech (Lateral Entry Scheme) from the Academic Year 2023-24 and onwards)

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

The LES students after securing admission shall pursue a course of study for not lessthan three academic years and not more than six academic years.

2. The student shall register for 120 credits and secure 120 credits with CGPA ≥ 5 from II year to IV-year B.Tech. programme (LES) for the award of B.Tech. degree.

3. The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.

4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech.(LES).

5. Promotion rule

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 24 credits out of 40 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

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

7. **LES students are not eligible for 2-Year B. Tech. Diploma Certificate.**

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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, smart watches, electronic gadgets 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. Confiscation of Cell phones, pager, palm computers, smart watches, electronic gadgets etc. and the same would be handed over only after punishment finalized by Malpractice Committee.
(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, pager, palm computers, smart watches, electronic gadgets 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. Confiscation of Cell phones, pager, palm computers, smart watches, electronic gadgets etc. and the same would be handed over only after punishment finalized by Malpractice Committee.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers, cell phones, smart watches, electronic gadgets 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 excluding Project work/ Mandatory Courses /Technical Seminar 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. Confiscation of Cell phones, pager, palm computers, smart watches, electronic gadgets etc. and the same would be handed over only after punishment finalized by Malpractice Committee.
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 hall-walk 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	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.

	examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all Semester End 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 state of inebriated/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 excluding Project work/ Mandatory Courses /Technical Seminar 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 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 enquiry.
4) Based on the explanation and recommendation of the committee action may be initiated.

Malpractice committee:

(a) Chief Superintendent Chairman

(b) Controller of Examinations Member

(c) Dean Academics Member

(d) Chief Examiner of the Course/ Subject Expert Member

(e) Concerned Head of the Department Member

(f) Observer 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 social responsibilities.

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. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of

theinformation to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities withan understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by contextual knowledge to assess societal,health, safety, legal and cultural issues, and the consequent responsibilities relevant to professionalengineering practice.
7. **Environment and sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainabledevelopment.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and normsof engineering practice. Individual and teamwork: Function effectively as an individual, and as amember or leader in diverse teams, and in multidisciplinary settings.
9. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for and have the preparation and ability to engage inindependent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OBJECTIVES (PSO's)

1. To analyze the modern electrical sciences and practices to intend and requirement of Electrical Power Generation, Transmission and Distribution.
2. To interpret, assess, test and estimate the performance of the Electrical Machines.
3. To illustrate the knack in the technology allied with effective conversion and control of green and clean electricity through Power Electronic and control technologies.

SEMESTER - I									
S.No	**Course Code**	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
				L	**T**	**P**		**CIE**	**SEE**
1	A400001	Matrices and Calculus	BSC	3	1	0	4	40	60
2	A400009	Engineering Chemistry	BSC	3	1	0	4	40	60
3	A402202	Electrical Circuit Analysis – I	ESC	3	0	0	3	40	60
4	A405202	C Programming and Data Structures	ESC	3	0	0	3	40	60
5	A402501	Elements of Electrical and Electronics Engineering	ESC	0	0	2	1	50	--
6	A405503	C Programming and Data Structures Laboratory	ESC	0	0	2	1	40	60
7	A403502	Computer Aided Engineering Drawing	ESC	1	0	2	2	40	60
8	A400502	Engineering Chemistry Laboratory	BSC	0	0	2	1	40	60
9	A400505	Introduction to Social Innovation	HSMC	0	0	2	1	40	60
10	A400703	Constitution of India	MC	2	0	0	0	-	-
	Total:			**15**	**2**	**10**	**20**		
	Total hours per Week:			**27**					

SEMESTER – II									
S.No	**Course Code**	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
				L	**T**	**P**		**CIE**	**SEE**
1	A400002	Ordinary Differential Equations and Vector Calculus	BSC	3	1	0	4	40	60
2	A400101	English for Skill Enhancement	HSMC	2	0	0	2	40	60
3	A400008	Applied Physics	BSC	3	1	0	4	40	60
4	A403504	Engineering Workshop Practice	ESC	0	0	3	1.5	40	60
5	A404202	Analog Electronic Circuits	ESC	3	0	0	3	40	60
6	A400503	English Language and Communication Skills Laboratory	HSMC	0	0	2	1	40	60
7	A400501	Applied Physics Laboratory	BSC	0	0	3	1.5	40	60
8	A404503	Analog Electronic Circuits Laboratory	ESC	0	0	3	1.5	40	60
9	A400506	Engineering Exploration & Practice	HSMC	0	0	3	1.5	40	60
10	A400704	Universal Human Values	MC	2	0	0	0	-	-
	Total:			**13**	**2**	**14**	**20**		
	Total hours per Week			**29**					
	Total Credits in I Year: 40								

	SEMESTER – III								
S.No	Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
				L	T	P		CIE	SEE
1	A400007	Numerical Methods and Complex Variables	BSC	3	1	0	4	40	60
2	A402203	Electrical Circuit Analysis – II	ESC	2	0	0	2	40	60
3	A402302	Electro Magnetic Fields	PCC	3	0	0	3	40	60
4	A402301	Electrical Machines -I	PCC	3	0	0	3	40	60
5	A402303	Power System-I	PCC	3	0	0	3	40	60
6	A402505	Electrical Machines Laboratory-I	PCC	0	0	2	1	40	60
7	A402503	Electrical Circuit Analysis Laboratory	ESC	0	0	2	1	40	60
8	A402509	Electrical Simulation Tools Laboratory	PCC	0	0	2	1	40	60
9	A405506	Python Programming Laboratory	ESC	0	1	2	2	40	60
10	A400702	Gender Sensitization	MC	2	0	0	0		
	Total:			**16**	**2**	**8**	**20**		
	Total hours per Week:			**26**					

	SEMESTER – IV								
S.No	Course Code	Course Title	Category	Hours per Week			Credits	Maximum Marks	
				L	T	P		CIE	SEE
1	A401201	Fluid Mechanics & Hydraulic Machinery	ESC	3	0	0	3	40	60
2	A402308	Power Systems-II	PCC	3	0	0	3	40	60
3	A404205	Switching Theory and Logic Design	ESC	2	0	0	2	40	60
4	A402304	Electrical Machines-II	PCC	3	0	0	3	40	60
5	A402307	Measurements and Instrumentation	PCC	3	0	0	3	40	60
6	A402508	Measurements and Instrumentation Laboratory	PCC	0	0	2	1	40	60
7	A404510	Switching Theory and Logic Design Laboratory	ESC	0	0	2	1	40	60
8	A402506	Electrical Machines Laboratory -II	PCC	0	0	2	1	40	60
9	A400507	Social Innovation in Practice	HSMC	0	0	2	1	40	60
10	A402801	Real Time project/Field Based Projects	PROJ	0	0	4	2	50	-
11	A400701	Environmental Sciences	MC	2	0	0	0		
	Total:			**16**	**0**	**12**	**20**		
	Total hours per Week			**28**					
	Total Credits in II Year: 40								

SEMESTER – V								
Course Code	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
			L	**T**	**P**		**CIE**	**SEE**
A402306	Power Electronics	PCC	3	1	0	4	40	60
A402305	Control Systems	PCC	3	1	0	4	40	60
A402312	Microprocessors & Microcontrollers	PCC	3	0	0	3	40	60
A402309	Power System Protection	PCC	3	0	0	3	40	60
	Professional Elective-I	**PEC**	3	0	0	3	40	60
A402512	Microprocessors & Microcontrollers Laboratory	PCC	0	0	2	1	40	60
A402507	Power Electronics& Simulation Laboratory	PCC	0	0	2	1	40	60
A402510	Control Systems & Simulation Laboratory	PCC	0	0	2	1	40	60
A400705	Intellectual Property Rights	MC	2	0	0	0		
	Total:		**17**	**2**	**6**	**20**		
	Total hours per Week:		**25**					

SEMESTER - VI								
Course Code	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
			L	**T**	**P**		**CIE**	**SEE**
A402314	CMOS VLSI Design	PCC	3	1	0	4	40	60
A402310	Power Semiconductor Drives	PCC	3	0	0	3	40	60
A402313	Digital Signal processing	PCC	3	0	0	3	40	60
PEC-II	**Professional Elective-II**	PEC	3	0	0	3	40	60
A402511	Electrical Simulation Tools Laboratory-II	PCC	0	0	3	1.5	40	60
A402513	VLSI Design laboratory	PCC	0	0	3	1.5	40	60
A400504	Advanced English Communication Laboratory	HSMC	0	0	2	1	40	60
A402514	Digital Signal Processing Lab	PCC	0	0	2	1	40	60
A402802	Industry Oriented Mini Project/Internship	PROJ	0	0	4	2	-	100
	Total:		**12**	**1**	**14**	**20**		
	Total hours per Week		**27**					
Total Credits in III Year: 40								

SEMESTER – VII								
Course Code	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
			L	**T**	**P**		**CIE**	**SEE**
A400102	Business Economics& Financial Analysis	**HSMC**	3	0	0	3	40	60
PEC-III	**Professional Elective-III**	PEC	3	0	0	3	40	60
PEC-IV	**Professional Elective-IV**	PEC	3	0	0	3	40	60
PEC-V	**Professional Elective- V**	PEC	3	0	0	3	40	60
OE-I	**Open Elective-I**	**OEC**	3	0	0	3	40	60
A402311	Power System Operation &Control	PCC	2	0	0	2	40	60
A402803	Major Project Phase-I	PROJ	0	0	6	3	40	60
	Total:		**17**	**0**	**6**	**20**	-	-
Total hours per Week:			**23**					

SEMESTER - VIII								
Course Code	**Course Title**	**Category**	**Hours per Week**			**Credits**	**Maximum Marks**	
			L	**T**	**P**		**CIE**	**SEE**
PEC-VI	**Professional Elective-VI**	PEC	3	0	0	3	40	60
OE-II	**Open Elective-II**	OEC	3	0	0	3	40	60
OE-III	**Open Elective-III**	OEC	3	0	0	3	40	60
A402804	Technical Seminar	PROJ	0	0	4	2	-	100
A402805	Major Project Phase-II	PROJ	0	0	18	9		
Total:			9	0	22	**20**		
Total hours per Week			**31**					
Total Credits in IV Year: 40								

PROFESSIONAL ELECTIVES			
S.No	**Course code**	**Course**	**Course name**
1	A402401	**PE-1**	Signals & Systems
2	A402402		Utilization of Electrical Energy
3	A402403		Optimization Techniques
4	A402404	**PE II**	Non-Conventional Energy Sources
5	A402405		Electric Smart Grid Technologies
6	A402406		Switch Mode Power Supply
7	A402407	**PE III**	High Voltage DC Transmission
8	A402408		Energy Storage Systems and Control
9	A402409		High Voltage Engineering
10	A402410	**PE IV**	Special Electrical Machines
11	A402411		Flexible AC Transmission Systems
12	A402412		Electrical & Hybrid Vehicles
13	A402413	**PE V**	Power Quality
14	A402414		Electrical Energy Conservation & Audit
15	A402415		Power Electronic Applications to Renewable Energy Systems
16	A402416	**PE VI**	Electrical Distribution Systems
17	A402417		AI Techniques in Electrical Engineering
18	A402418		Power System Reliability

List of Open Elective

Open Elective-I		
S.No	**Course Code**	**Course Name**
1	A404601	Fundamentals of Internet of Things
2	A404602	Principles of Digital Signal Processing
3	A402601	Renewable Energy Sources
4	A402602	Basics of Power Electronics & Drives
5	A405604	Java Programming
6	A405602	Fundamentals of Operating Systems
7	A403601	Fundamentals of Engineering Materials
8	A403602	Basics of Thermodynamics
9	A400601	Basics of Logistics and Supply Chain Management
10	A400602	Industrial Relations
11	A401601	Disaster Preparedness & Planning Management
12	A401602	Environmental Impact Assessment
Open Elective-II		
1	A404603	Sensors and Transducers
2	A404604	Image Processing
3	A402603	Electrical Vehicle Technology
4	A402604	Basics of Power Plant Engineering
5	A405601	Fundamentals of Database management Systems
6	A405605	Web programming
7	A403603	Fundamentals of Manufacturing Processes
8	A403604	Fundamentals of Automobile Engineering
9	A400603	Entrepreneurship
10	A400604	Ethics in Business & Corporate Governance
11	A401603	Remote Sensing & Geographical Information Systems
12	A401604	Solid Waste Management
Open Elective-III		
1	A404605	Fundamentals of Embedded Systems
2	A404606	Data Communications
3	A402605	Nano Technology
4	A402606	EV Batteries & Charging System
5	A405603	Fundamentals of Computer networks
6	A405606	Fundamentals of DevOps
7	A403605	Industrial safety Engineering
8	A403606	Waste to Energy
9	A400605	Basics of Marketing
10	A405607	Cloud Computing
11	A401605	Energy Efficient Buildings
12	A401606	Environmental Pollution

(A400001) MATRICES AND CALCULUS

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

UNIT-I

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 equations and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT-II

Eigen values and Eigen vectors:

Linear Transformation and Orthogonal transformation: 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 orthogonal transformations.

UNIT-III

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-IV

Multivariable calculus (Partial Differentiation and applications):

Partial differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V

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 Sphericaland Cylindrical polar coordinates)for triple integrals.

TEXT BOOKS:

1. Higher Engineering Mathematics, (36thEdition), B.S. Grewal, Khanna Publishers, 2010.
2. Advanced Engineering Mathematics, (5thEdition), R.K. Jain and S.R.K Iyengar,Narosa Publications,2016.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics,(9th Edition),Erwinkreyszig,JohnWiley& Sons,2006.
2. Calculus and Analytic geometry, (9thEdition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
3. A text book of Engineering Mathematics, (10th Edition), N.P. Bali and Manish Goyal, Laxmi Publications,Reprint, 2019.
4. Higher Engineering Mathematics, (11thReprint), Ramana B.V., Tata McGraw Hill New Delhi, 2010

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

1. Solve linear system of equations represented by matrices
2. Obtain eigen values, eigen vectors and perform diagonalization of a square matrix.

3. Verify mean value theorems & evaluation of improper integrals by using Beta and Gamma functions.
4. Develop the skill of determining optimal values of multivariable functions using classical methods.
5. Evaluate the multiple integrals and apply the concept to find are as, volumes.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**										**2**
CO2	**3**	**3**										**2**
CO3	**3**	**3**										**2**
CO4	**3**	**3**										**2**
CO5	**3**	**3**										**2**

(A400009) ENGINEERING CHEMISTRY

L	T	P	C
3	1	0	4

B.Tech (EEE): I Year I Semester

UNIT-I: Electrochemistry, Batteries and Corrosion

Electrochemistry: Electrode potential, standard electrode potential and E.M.F of the cell. Electrochemical cell, Nernst equation- derivation and applications, Types of electrodes- Quinhydrone electrode, Calomel electrode and Glass electrode. Electro chemical series and its applications.

Batteries- primary (Lithium cell), secondary (Lead acidstorage battery and Lithium-ion battery) and Fuel cells (H_2-O_2 and methanol-oxygen), Solar cells - Introduction andapplications of Solar cells.

Corrosion: Introduction, Definition, Causes and effects of corrosion, Theories of chemical and 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 cathodicmethods, Surface coatings- Metallic coatings, hot dipping, galvanizing and tinning, Electroplating- Copper plating and electroless plating - Nickel plating.

UNIT-II: Material Chemistry - High Polymers

Types of polymerizations (addition, condensation and copolymerization).

Plastics: Thermoplastic and Thermosetting resins, Compounding and fabrication of plastics (compression and injection moulding). Preparation, properties, engineering applications of PVC, Teflon and Bakelite.

Fibers: Characteristics of fibers - preparation, properties and uses of Nylon-6,6 and Dacron, Fiber Reinforced Plastics (FRP) - applications.

Rubbers: Natural rubber and its vulcanization. Elastomers: Buna-s, Butyl rubber and Thiokol rubber.

Conducting polymers: Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Preparation and applications of Polyvinyl acetate, Polylactic acid and poly vinyl alcohol.

UNIT-III: Energy Sources

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages

UNIT-IV: Water Technology

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

Industrial water treatment, Boiler Troubles-Scales and sludges, Caustic embrittlement, Boiler corrosion, Priming andfoaming. 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: Engineering Materials

Cement: Portland cement, its composition, setting and hardening.

Smart materials: Smart materials and their engineering applications

Advanced Glass Technology: Structure and nature of glasses, transformation range behaviour, dependence of physico-chemical characteristic of glasses on their constituents. Strength of glass and glass articles.

Lubricants: Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

Text Books:

1. Engineering chemistry (1st edition), B. Rama Devi & Ch. VenkataRamana Reddy; Cengage Learning, 2012.
2. Engineering Chemistry (1st edition), P. C. Jain and M. Jain, DhanapatRai& Sons.
3. Engineering chemistry (1st edition), Dr. Bharathikumari, Dr. Jyotsna.
4. Engineering chemistry (1st edition), Thirumala chary, E. Laxminyarana, SCITECH Publications (India) Pvt.Ltd.

Reference Books:

1. Engineering Chemistry (2nd edition), Shikha Agarwal; Cambridge University Press, 2015.
2. Engineering Chemistry (2nd edition), Wiley India Pvt. Ltd., Vairam and others, 2014.
3. Engineering Chemistry (1st edition), PrasanthRath, Cengage Learning, 2015.
4. Applied Chemistry (1st edition), H.D. Gesser, Springer Publishers.
5. Engineering Chemistry (3rd edition), B. Siva Shankar, Tata McGraw Hill Publishing Limited, 2015.
6. Text of Engineering Chemistry (12th edition), S. S. Dara, Mukkanti, S. Chand & Co, New Delhi, 2006.
7. Chemistry of Engineering Materials (5th edition), C. V. Agarwal, C. P. Murthy, A. Naidu, Wiley India, 2013.
8. Chemistry of Engineering Materials (3rd edition), R. P. Mani, K. N. Mishra, Cengage Learning, 2015

Course Outcomes:

After completion of the course students will be able to

1. Apply the concept of electrochemistry and corrosion science in various practical applications.
2. Predict the different engineering applications by preparing various polymers.
3. Summarize the manufacturing process of various fuels and their applications in daily life.
4. Understand the benefits of treated water as source in steam generation in industrial application.
5. Illustrate the importance and applications of various advanced engineering materials.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**										**2**
CO2	**3**	**3**										**2**
CO3	**3**	**3**										**2**
CO4	**3**	**3**										**2**
CO5	**3**	**3**										**2**

(A402202) ELECTRICAL CIRCUIT ANALYSIS – I

L	T	P	C
3	0	0	3

B.Tech (EEE): I Year I Semester
Prerequisites: Mathematics

UNIT-I:

Network Elements & Laws: Active elements, Independent and dependent sources. Passive elements— R, L and C,Energy stored in inductance and capacitance, Kirchhoff's laws, Source transformations, Star-delta transformations, Node voltage method, Mesh current method including super node and super mesh analysis.

UNIT-II:

Single-Phase Circuits: RMS and average values of periodic sinusoidal and non- sinusoidal waveforms, Phasor representation, Steady-state response of series, parallel and series-parallel circuits. Impedance, Admittance, Current locus diagrams of RL and RC series and parallel circuits with variation of various parameters. Resonance: Series and parallel circuits, Bandwidth and Q-factor.

UNIT-III:

Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorems, Maximum power theorem.Tellegen's theorem, Compensation theorem, Milliman's theorem and Reciprocity theorem. (AC & DC).

UNIT-IV:

Poly-phase Circuits: Analysis of balanced and unbalanced 3-phase circuits, Star and delta connections,Measurement of three-phase power for balanced and unbalanced loads.

UNIT-V:

Coupled circuits: Concept of self and mutual inductance, Dot convention, Coefficient of coupling, Analysis of circuits with mutual inductance.

Topological Description of Networks: Graph, tree, chord, cut-set, incident matrix, circuit matrix and cut-setmatrix,

TEXTBOOKS:

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, "Network Analysis and Synthesis", McGraw Hill, 2nd Edition, 2019.

REFERENCE BOOKS:

1. B. Subramanyam, "Electric Circuit Analysis", Dreamtech Press & Wiley, 2021.
2. James W.Nilsson, Susan A.Riedel, "Electric Circuits", Pearson, 11th Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, "Circuits and Networks: Analysis and Synthesis", McGraw Hill, 5th Edition, 2017.
4. Jagan N.C, Lakshrninarayana C., "Network Analysis", B.S. Publications, 3rd Edition, 2014.
5. William Hayt H, Kimmerly Jack E. and Steven Durbin M, "Engineering Circuit Analysis",McGrawHill,6th Edition, 2002.
6. Chakravarthy A., "Circuit Theory", Dhanpat Rai& Co., First Edition, 1999.

On completion of the course, students will be able to

1. Understand network analysis, techniques using mesh and node analysis.
2. Explain the principle of AC fundamentals, series parallel circuits, locus diagram and resonance.
3. Analyze electric circuits using network theorems.
4. Explain and analyze polyphase circuits.
5. Explain basic concepts of coupled circuits & analyze networks adopting network topology.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	**3**	**3**	**1**	**0**	**-**	**2**	**1**	**1**	**0**	**0**	**1**	**1**
CO2	**3**	**3**	**1**	**0**	**-**	**2**	**1**	**1**	**0**	**0**	**2**	**3**
CO3	**3**	**2**	**1**	**2**	**-**	**2**	**1**	**1**	**0**	**0**	**3**	**2**
CO4	**3**	**2**	**1**	**0**	**-**	**2**	**1**	**1**	**0**	**0**	**3**	**2**
CO5	**3**	**2**	**1**	**0**	**-**	**2**	**1**	**1**	**0**	**0**	**3**	**2**

(A405202)C PROGRAMMING & DATA STRUCTURES

L	T	P	C
3	0	0	3

B.Tech (EEE): I Year I Semester

UNIT-I

Overview of C: Basic structure of C programs, programming style, Executing a C program. **Constants, Variables, and Data Types:** Introduction, Character set, C-Tokens ,keywords and identifiers, constants, variables, Data types, declaration of variables, declaration of Storage class, assigning values to variables, defining symbolic constant.

Operators & Expressions: Introduction, Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment & Decrement Operators, Conditional Operators, Bitwise Operator, Special Operators. Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators.

UNIT-II

Decision Making: Introduction, Decision making with if statement, simple if statement, the if---else---statement, Nesting of if---else---statements. the else-if ladder, the switch statement, the?: operator, the go to statement.

Looping: Introduction, the while statement, the do -while statement, for statement, break and continue statements. Arrays: Introduction, One-Dimensional Arrays, Declaration of One-Dimensional Arrays, Initialization of One- Dimensional Arrays, Two-Dimensional Arrays, Initializing two dimensional arrays.

UNIT-III

Character Arrays and Strings: Introduction, declaring and initializing string variables, reading strings from terminal, writing strings to screen, string-handling functions.

Functions: Introduction, definition of functions, returnvalues, function calls, function declaration, scope, visibility and lifetime of variables.

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self- referential structures in linked list (no implementation)

UNIT-IV

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks- Operations, array and linked representations of stacks, stack applications, Queues- operations, array, and linked representations.

UNIT-V

Searching and Sorting: Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs.

Textbooks

1. Programming in ANSI C, 8th Edition,E. Balagurusamy McGraw Hill Educationpublication,2019.
2. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and SusanAnderson Freed, Universities Press.

Reference Books

1. C Programming Absolute Beginner's Guide,3rd Edition, Pearson Education ,2014.
2. Learn C the Hard Way,1stEdition,ZedA.Shaw, Pearson Education,2018
3. The C-Programming Language,2nd Edition, Brian Kernighan and Dennis Ritchie, Pearson Education,2014.
4. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

Course Outcomes

By the end of the course Students shall be able

1. Describe the structure of C program and explain the various components of it.
2. Use iterative statements for writing the C programs.
3. Organize data in Arrays and perform operations on data stored in Arrays.
4. Define & describe user defined functions in C language.
5. Differentiate structures, unions and manipulate data using pointers.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**1**									
CO2	**3**	**1**	**3**									
CO3	**3**	**2**	**2**									
CO4	**2**	**2**	**3**									
CO5	**3**	**2**	**2**									

(A402501) ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P	C
0	0	2	1

B.Tech (EEE): I Year I Semester

List of Experiments/Demonstrations:
PART-A (compulsory)

1. Verification Ohm's Law.
2. Verification of KVL and KCL.
3. Verification of Thevenin's and Norton's theorem.
4. Verification of Superposition theorem
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
7. Performance Characteristics of a DC Shunt Motor
8. Open Circuit and Short Circuit Tests on 1-phase Transformer

PART-B (any two experiments from the given list)

9. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
10. Verification of Reciprocity and Milliman's Theorem.
11. Verification of Maximum Power Transfer Theorem.
12. Determination of form factor for non-sinusoidal waveform
13. Transient Response of Series RL and RC circuits for DC excitation.

Course Outcomes: After completion of the course the student must be able to

1. Verify the basic Electrical circuits through different experiments.
2. Analyze the transient responses of R, L and C circuits for different input conditions.
3. Calculate the of Impedance and Current of RL, RC and RLC series Circuits.
4. Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods.
5. Measure the Active and Reactive Power in a single phase transformer.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	3	2	1						1	1	2	2
CO2	3	2	1			2			1	1	2	2
CO3	3	2	1			2			1	1	2	2
CO4	3	2	1			1	1	1	1	1	1	2
CO5	3	2	1			2	1	1	1	1	2	2

(A405503)C PROGRAMMING& DATA STRUCTURES LAB

L	T	P	C
0	0	2	1

B.Tech (EEE): I Year I Semester

[Note: The programs may be executed using any available Open Source/ Freely available IDESome of the Tools available are:
Code Lite: https://codelite.org/
Code: Blocks: http://www.codeblocks.org/ DevCpp : http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference]

I. OPERATORS AND EVALUATION OF EXPRESSIONS

Demonstration

1. Write a C program to print greetings message on the screen.2.Write a C program to illustrate usage of comments in C.
2. Write a simple program that prints the results of all the operators available in C
3. (Including pre/post increment, bitwise and/or/not. etc.). Read required operand values from standard input.
4. Write a C program that converts given data type to another using auto conversion and casting. Take the valuesfrom standard input.
5. Write a program for finding the max and min from the three numbers (using ternary operator).

Experiment

6. Write a C program to compute simple, compound interest.
7. Write a C program that declares Class awarded for a given percentage of marks, where mark = 70% =Distinction.
8. (Read percentage from standard input.)

II. Expression EvaluationDemonstration

1. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Findthe time taken by the ball to reach each floor. (Use the formula $s = ut+(1/2)at^2$ where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).
2. Write a program that asks the user to enter the highest rainfall ever in one season for a country, and the rainfall inthe current year for that country, obtains the values from the user, checks if the current rainfall exceed the highest rainfall and prints an appropriate message on the screen. If the current rainfall is higher, it assigns that value as the highest rainfall ever. Use only the single-selection form of the if statement.

Experiment

3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
4. Write a C program to find the roots of a Quadratic equation.

III. Iterative statements

Demonstration

1. Write a program that reads an integer (5 digits or fewer) and determines and prints how many digits in theinteger are 9s.
2. Write a program that keeps printing the powers of the integer 3, namely 3, 9, 27, 91, 273, and so on. Your loopshould not terminate (i.e., you should create an infinite loop). What happens when you run this program?
3. Write a program that reads the radius of a circle (as a float value) and computes and prints the diameter, thecircumference and the area. Use the value 3.14159 for π

Experiment

4. Write a menu driven C program that allows a user to enter n numbers and then choose between finding thesmallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement todetermine what action to take. Display an error message if an invalid choice is entered.
5. Write a C program to construct a pyramid of numbers as follows:

```
1                    1
1 2                  2 2
1 2 3                3 3 3
1 2 3 4              4 4 4 4
1 2 3 4 5            5 5 5 5 5
```

IV. Arrays, Pointers, and FunctionsDemonstration

1. Write a C program to find the minimum, maximum and average in an array of integers.
2. Write a function to compute mean, variance, Standard Deviation, sorting of n elements in a single dimensionarray.
3. Write a C program that uses functions to perform the following:

i. Addition of Two Matrices ii. Multiplication of Two Matrices iii. Transpose of a matrix.

Experiment

4. Write a C program to find the GCD (greatest common divisor) of two given integers.
5. Write a C program to compute x^n

V. Strings Demonstration

1. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
2. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent c.
3. Write a C program that uses functions to perform the following operations:
   - To insert a sub-string into a given main string from a given position.
   - To delete n Characters from a given position in a given string.

Experiment

4. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with orwithout a meaning like madam, civic, noon, abcba, etc.)
5. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.
6. Write a C program to count the lines, words and characters in a given text.

VI Data StructuresDemonstration

1. Write a program that uses functions to perform the following operations on singly linkedlist

i) Creation ii) Insertion iii) Deletion iv) Traversal

2. Write a program that implement stack (its operations) using

i) Arrays ii) Pointers

3. Write a program that implement Queue (its operations) using

i) Arrays ii) Pointers

Experiment

4. Write a program that uses functions to perform the following operations on doubly linkedList.

i) Creation ii) Insertion iii) Deletion iv) Traversal

5. Write a program that uses functions to perform the following operations on circular linkedList. i) Creation ii) Insertion iii) Deletion iv) Traversal

VII Searching & Sorting

Demonstration

1. Write a C program that uses non recursive function to search for a Key value in a given list of integers usinglinear search method.
2. Write a C program that uses non recursive function to search for a Key value in a given sorted list of integersusing binary search method.
3. Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

Experiment

5. Write a C program that sorts the given array of integers using selection sort in descending order
6. Write a C program that sorts the given array of integers using insertion sort in ascending order

Textbooks

1. Programming in ANSI C, 8th Edition, E. Balagurusamy McGraw Hill Education publication,2019.
2. Fundamentals of Data Structures in C, 2 nd Edition, E. Horowitz, S. Sahni and SusanAnderson Freed, Universities Press.

Reference Books

1. C Programming Absolute Beginner's Guide,3rd Edition, Pearson Education ,2014.
2. Learn C the Hard Way,1st Edition, Zed A. Shaw, Pearson Education,2018
3. The C-Programming Language,2nd Edition, Brian Kernighan and Dennis Ritchie, Pearson Education,2014.
4. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

Course Outcomes

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

1. Formulate the algorithms for simple problems and translate given algorithms to a working and correctprogram
2. Correct syntax errors as reported by the compilers identify and correct logical errors encountered duringexecution
3. Represent and manipulate data with arrays, strings and structures and
4. Develop applications using pointer concept.
5. Develop reusable code with the help C-functions

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

(A403502) COMPUTER AIDED ENGINEERING DRAWING

B.Tech (EEE) I Year I Sem.

L	T	P	C
1	0	2	2

UNIT – I:

Introduction to Engineering Drawing: Principles of Engineering Drawing and their Significance, Introduction toComputer aided drafting – views, commands.

Computer aided drafting of conic Sections: Ellipse, Parabola and Hyperbola – General Method (eccentricity)only.

Computer aided drafting of Cycloid, Epicycloids and Hypocycloid.

UNIT- II:

Orthographic Projections: Introduction to Principles of Orthographic Projections – Conventions – Projections ofPoints and Lines, Projections of Plane regular geometric figures.

Computer aided orthographic projections – points, lines and planes

UNIT – III:

Projections of Regular Solids: Introduction to Regular Solids – Prism, Cylinder, Pyramid, Cone

Computer aided projections of solids – Regular views

UNIT – IV:

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric

Projection of objects having non- isometric lines, Isometric Projection of Spherical Parts using computer aideddrafting.

UNIT – V:

Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions

Conversion of orthographic projection into isometric view and vice versa using computer aided drafting.

TEXT BOOKS:

1. Engineering Drawing, 51st Edition, N.D. Bhatt, Charotar Pub, 2012
2. Computer Aided Engineering Drawing, 2nd Edition, K. Balaveera Reddy et al, CBS Publishers, 2015

REFERENCE BOOKS:

1. Engineering Drawing, 2nd Edition, Basant Agrawal and C M Agrawal, McGraw Hill, 2014
2. Engineering Drawing, 1st Edition, M. B. Shah, B.C. Rane, Pearson, 2015
3. Engineering Drawing, 1st Edition, N. S. Parthasarathy and Vela Murali, Oxford, 2015
4. Engineering Drawing and graphics Using AutoCAD, 3rd Edition, T. Jeyapoovan, Vikas, S.Chand and CompanyLtd, 2000

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

1. Apply computer aided drafting tools to create 2D objects like Conic section and Cycloidal curves
2. Sketch the Orthographic projection of Point, Line and Plane objects by drafting tools
3. Create, read and interpret engineering drawings of Solids by computer tools
4. Create and interpret 2D and 3D Isometric objects by drafting tools

5. Conversion of orthographic projection into isometric view and vice versa by using computer aideddrafting tools

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

(A400502) ENGINEERING CHEMISTRY LAB

(Common to all Branches)

L	T	P	C
0	0	2	1

B.Tech (EEE) I Year I Sem.Lab

Experiments:

1. Estimation of Hardness of water by EDTA Method.
2. Estimation of Alkalinity of Water.
3. Estimation of Copper by Colorimetric Method.
4. Conductometric Titration of a Strong Acid vs a Strong Base.
5. Conductometric Titration of a Weak Acid vs a Strong Base.
6. Potentiometric Titration of a Strong Acid vs a Strong Base.
7. Potentiometric Titration of Ferrous Ammonium Sulphate (FAS) vs Potassium Dichromate.
8. Preparation of Thiokol Rubber.
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 (by potentiometric)
13. Thin Layer Chromatography (Ortho-Nitro phenol &Para-Nitro phenol).
14. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.

Virtual lab experiments:

1. Construction of Fuel Cell and its working.
2. Smart Materials for biomedical applications.
3. Batteries for Electrical Vehicles.
4. Functioning of Solar Cell and its applications.

Reference Books:

1. Engineering Chemistry Lab Manual (1st edition), Glaze Publishers 2018.
2. Engineering chemistry (1st edition), B. Rama Devi & Ch. VenkataRamana Reddy; Cengage Learning, 2012.
3. A Textbook of Engineering Chemistry (1st edition), Sashi Chawla, DhanapathRai& Sons.

Course Outcomes:

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

1. Determine the extent of hardness present in water and its consequences in industrial operations
2. Prepare polymer like Thiokol Rubber
3. Estimate the strength of solutions, p^H of various solutions
4. Determine the viscosity and surface tension of various liquids
5. Apply the electrochemical concepts in conductometric and potentiometric titrations

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**											
CO2	**3**											
CO3	**3**											
CO4	**3**											
CO5	**3**											

(A400505) INTRODUCTION TO SOCIAL INNOVATION

L	T	P	C
0	0	2	1

WEEK-1
Types and features of community- Rural, Suburban, Urban and Regional

WEEK-2
Service based learning, Aims of Community based projects, Sustainable Development Goals

WEEK-3
Community visit, Report Writing, Resource Diagram, Chapati Diagram, Transect Walk

WEEK-4
The non-profit sector, public sector, the private sector, the informal sector

WEEK-5
Poster presentation on four sectors

WEEK-6
Process of Design Thinking

WEEK-7
Social organizations and enterprises, social movements

WEEK-8
Social softwares and open-source methods

WEEK-9
Introduction to Ethics, moral values, significance of professional ethicscode of conduct for engineers

WEEK-10
Identify ethical dilemmas in different tasks of engineering, applying moral theories and codes of conduct forresolution of ethical dilemmas

WEEK-11
Case studies on Engineering Ethics

WEEK-12
Documentation, Steps for Patent filing and Startups, Poster presentation

TEXT BOOKS

1. Social Entrepreneurship for the 21st Century: Innovation Across the Non Profit, Private and Public Sectors;Georgia LevensonKeohane; Tata McGraw Hill
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, YeheskelHasenfeld; PalgraveMacmillan
3. HassoPlattner, ChristophMeinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply",Springer, 2011.
4. Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School Publishing)Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author)
5. Engineering Ethics: An Industrial Perspective; Gail Baura; Elsevier
6. Intellectual Property and Financing Strategies for Technology Startups; Gerald B. Halt, Jr., John C. Donch,Jr., Amber R. Stiles, Robert Fesnak; Springer
7. Fundamentals of Intellectual Property (English) 1st Edition (Paperback, Dr. Kalyan C. Kankanala) Publisher:Asia Law House ISBN: 9789381849514, 938184951X Edition: 1st Edition, 2012.

8. Indian Patent Law (English, Paperback, Kalyan C. Kankanala) Publisher: Oxford University Press- NewDelhi, ISBN: 9780198089605, 0198089600 Edition: 2012

Course Outcomes

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

1. Identify community issues through community Interaction
2. Illustrate the factors affecting social innovation in various sectors
3. Apply design thinking concept to analyze the community problems
4. Adopt the ethical values in implementing the Social innovation
5. Describe the process of property rights and patent filing.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1						**1**	**2**		**3**	**2**		
CO2						**2**	**2**		**3**	**3**		
CO3				**2**		**2**	**3**		**2**	**3**		
CO4						**2**	**3**	**3**	**2**	**2**		
CO5		**2**		**2**		**2**	**3**		**2**	**3**		

(A400703) CONSTITUTION OF INDIA
(Common to all branches)

L	T	P	C
2	0	0	0

UNIT - 1

History of Making of the Indian Constitution - History of Drafting Committee

UNIT - 2

Philosophy of the Indian Constitution- Preamble Salient Features

UNIT - 3

Contours of Constitutional Rights & Duties - Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

UNIT - 4

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT - 5

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

REFERENCE BOOKS:

1) The Constitution of India, 1950 (Bare Act), Government Publication.
2) Dr. B. R. Ambedkar framing of Indian Constitution, Dr. S. N. Busi, 1st Edition, 2015.
3) Indian Constitution Law (7thEdition), M. P. Jain, Lexis Nexis, 2014.
4) Introduction to the Constitution of India, D.D. Basu, Lexis Nexis, 2015.

COURSE OUTCOMES:

On completion of the course students will be able to

1) Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2) Discuss the intellectual origins of the framework of argument that informed the conceptualization of socialreforms leading to revolution in India.
3) Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under theleadership of Jawaharlal Nehru.

4) Discuss the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution

5) Discuss the passage of the Hindu Code Bill of 1956.

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

(A400002) ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

B.Tech (EEE) I Year II Semester

L	T	P	C
3	1	0	4

UNIT-I

First Order ODE:

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's differential equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

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, cosax,polynomials in x, $(x)$and $x(x)$, method of variation of parameters.

UNIT-III

Laplace transforms:

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem and Second shifting theorem. Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't'.Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions. Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by LaplaceTransform method..

UNIT-IV

Vector Differentiation:

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

UNIT-V

Vector Integration:

Line, Surface and Volume Integrals. Theorems of Green, 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, (5thEdition),R.K.JainandS.R.K.Iyengar,NarosaPublications,2016.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, (9th Edition),Erwinkreyszig, JohnWiley& Sons,2006.
2. Calculus and Analytic geometry, (9thEdition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
3. A text book of Engineering Mathematics, (10thEdition), N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2019.
4. Higher Engineering Mathematics, (9thEdition), H.K.Dassand Er.Rajnish Verma,SChandand company Limited, NewDelhi, 2011.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Determine first order differential equations and obtain solutions.
2. Solve the Higher order differential equations and apply the differential equation concepts to real world problems.
3. Use the Laplace transforms techniques for solving ODE's.
4. Evaluate Gradient – Divergence – Curl, Directional derivatives.
5. Evaluate the line, surface and volume integrals and converting them from one to another.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**										**2**
CO2	**3**	**3**										**2**
CO3	**3**	**3**										**2**
CO4	**3**	**3**										**2**
CO5	**3**	**3**										**2**

(A400101) ENGLISH FOR SKILL ENHANCEMENT

B.Tech (EEE) I Year II Semester	L	T	P	C
	2	0	0	2

UNIT - I

Chapter entitled 'Toasted English' by R.K.Narayan from "English: Language, Context and Culture" published by Orient Black Swan, Hyderabad.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes -Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives -Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.
Reading: Reading and Its Importance- Techniques for Effective Reading.

Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT – II

Chapter entitled 'Appro JRD ' by Sudha Murthy from " English Language , Context and Culture" publishedby Orient Black Swan ,Hyderabad.

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Sub-Skills of Reading – Skimming and Scanning

UNIT – III

Chapter entitled 'Lessons from Online Learning' by F.HaiderAlvi, Deborah Hurst et al from "English:Language, Context and Culture" published by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.
Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.
Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.
Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, EmailEtiquette, Job Application with CV/Resume.

UNIT - IV

Chapter entitled 'Art and Literature' by Abdul Kalam from "English: Language, Context and

Culture"published by Orient BlackSwan, Hyderabad.

Vocabulary: Standard Abbreviations in English Grammar: Redundancies and Clichés in Oral and WrittenCommunication.

Reading: Writing: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice WritingPractices
Essay Writing-Writing Introduction and Conclusion -Précis Writing

UNIT - V
Grammar: Common Errors in English (Covering all the other aspects of grammar which were not covered in theprevious units)
Reading: Writing: Reading Comprehension-Exercises for Practice Technical Reports- Introduction.

NOTE

Listening and Speaking Skills which are given under in AICTE Model Curriculum are covered in the syllabus ofELCS Lab Course.

- NOTE 1: As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is Open- ended, besides following the prescribed textbook, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

- NOTE 2: Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt BlendedLearning in dealing with the course contents .They are advised to teach 40 percent of each topic from the syllabus in blended mode.

TEXT BOOK:

1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS:

1. Effective Academic Writing, (2nd edition) by Liss and Davis (OUP) 2014.
2. Richards, Jack C. Interchange Series. Introduction, ,(4th edition), Cambridge University Press 2022
3. Remedial English Grammar by Wood F.T, Macmillan.2007.
4. Learn English: A Fun Book of Functional Language, Grammar and Vocabulary, (2nd edition)Chaudhuri,Santanu Sinha,. Sage Publications India Pvt. Ltd.2018
5. Technical Communication,(1st edition), Wiley India Pvt. Ltd.2019
6. English for Technical Communication for Engineering, Vishwamohan, Aysha 2013

Course Outcomes:

On completion of the course students will be able to

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known passages.
5. Acquire basic proficiency in reading and writing modules of English and take an active part in draftingparagraphs, letters, essays, abstracts, precis, and reports in various contexts.

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

(A400008) APPLIED PHYSICS

B.Tech (EEE) I Year II Semester

L	T	P	C
3	1	0	4

UNIT – I

QUANTUM MECHANICS:

Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect – de Broglie hypothesis- Davisson and Germer experiment – Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

ELECTRIC PROPERTIES OF SOLIDS:

Free electron theory (Drude& Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

UNIT – II

SEMICONDUCTORS AND DEVICES:

Intrinsic and extrinsic semiconductors, Variation of Fermi level with temperature – Hall Effect - Construction,principle of operation and characteristics of P-N Junction diode, Zener diode

PHOTONIC DEVICES

Direct and indirect band gap semiconductors –LED, PIN diode, avalanche photo diode (APD) and solar cells, theirstructure, materials, working principle and characteristics.

UNIT – III

LASERS

Laser beam characteristics-three quantum processes-Einstein coefficients and their relations-lasing action - pumpingmethods- ruby laser, He-Ne laser , CO_2 laser - semiconductor laser-applications of laser.

FIBER OPTICS:

Introduction to optical fiber - advantages of optical fibers - total internal reflection - construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers- losses in optical fiber - optical fiber for communication system - applications.

UNIT - IV

DIELECTRIC MATERIALS

Dielectric Materials: Basic definitions- types of polarizations (qualitative) –Local field – Clasius Mossoti Equationferroelectric, piezoelectric, and pyroelectric materials – applications

MAGNETIC MATERIALS:

Introduction to magnetic materials - Hysteresis-soft and hard magnetic materials- magnetostriction, magneto resistance - applications - bubble memory devices, magnetic field sensors and multi ferroics.

UNIT - V

ENERGY MATERIALS:

Conductivity of liquid and solid electrolytes- super ionic conductors - materials and electrolytes for super capacitors rechargeable ion batteries, solid fuel cells.

N**ANOTECHNOLOGY**

Nano scale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapour deposition (PVD) - chemical vapor deposition (CVD) characterization techniques - XRD, SEM &TEM - applications of nano materials.

TEXT BOOKS

1. Engineering Physics(3rd edition), PK Palanisamy, SciTech Publications, 2015.
2. Essentials of Nan science&Nanotechnology(1st Edition), Narasimha Reddy Katta, Typical Creatives NANODIGEST, 2021.

REFERENCES

1. Fundamentals of Physics.(6th edition), Halliday, R.Resnick and J.Walker,John Wiley and Sons, 2001.
2. Quantum Physics,(2nd edition), H.C. Verma, TBS Publication, 2012
3. Introduction to Solid State Physics, (7th edition), Charles Kittel, Wiley Eastern, 2019.
4. Physics of Semiconductor devices (4th edition), Simon.M Sze and Kwok K . Ng, Wiley Student Edition,2006.

COURSE OUTCOMES

On completion of the course students will be able to

1. Understand the concepts of Quantum mechanics and visualize the differences between the solids by theirclassification.
2. Identify and analyze the importance of semiconductors and semiconductor devices in Science and EngineeringApplications.
3. Appreciate the features and applications of Lasers and Optical fibers.
4. Applying the fundamental properties of dielectric and magnetic materials in different engineering fields.
5. Evaluate various aspects of Energy Materials and Nano-materials and their applications in diverse fields.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO2	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO3	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO4	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO5	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

(A403504) ENGINEERING WORKSHOP PRACTICE

L	T	P	C
0	0	3	1.5

B.Tech. I Year II Sem

Pre-requisites: Practical skill

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

I. Carpentry
II. Fitting
III. Tin-Smithy
IV. Foundry
V. Welding Practice
VI. House-wiring

2. TRADES FOR DEMONSTRATION & EXPOSURE:

Black Smithy ,Plumbing, Lathe, Power tools

TEXT BOOKS:

1. Workshop Practice, B. L. Juneja,Cengage, 2016
2. Workshop Manual, K. Venugopal, Anuradha Pub, 2012

REFERENCE BOOKS:

1. Work shop Manual, 2nd Edition, P. Kannaiah& K.L. Narayana, Scitech Publishers, 2008
2. Workshop Manual, 6th Edition, Venkat Reddy, BS Publications, 2008

Course Outcomes:

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

1. Study and practice on trade tools and their operations
2. Practice and prepare components using workshop trades including carpentry, fitting, Tin smithy.
3. Practice and prepare components using workshop trades including Foundry, welding.
4. Practice and prepare components using workshop trades including House wiring, black smithy and Plumbing.
5. Acquire knowledge by exposure to modern Tools.

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

(A404202) ANALOG ELECTRONIC CIRCUITS

B. Tech. (EEE) I Yr II-Semester

L	T	P	C
3	0	0	3

UNIT-I

Diode and Bipolar Transistor Circuits: P-N junction diode, I-V characteristics of a diode; review of half-wave andfull-wave rectifiers, clamping and clipping circuits. Input output characteristics of BJTin CB, CE, CC configurations,biasing circuits, Load line analysis, common-emitter, common-base and common collector amplifiers; Small signal equivalent circuits.

UNIT-II

FET Circuits: FET Structure and VI Characteristics, MOSFET structure and I-V characteristics. MOSFET as a switch. Small signal equivalent circuits-gain, input and output impedances, small-signal model and common-source, common-gate and common-drain amplifiers, trans conductance, high frequency equivalent circuit.

UNIT-III

Multi-Stage and Power Amplifiers: Direct coupled and RC Coupled multi-stage amplifiers; Differential Amplifiers,Power amplifiers-Class A, Class B, Class C

UNIT-IV

Feedback Amplifiers: Concepts of feedback– Classification of feedback amplifiers– General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems.

Oscillators: Condition for Oscillations, RC type Oscillators –RC phase shift and Wien-bridge Oscillators, LC type Oscillators–Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators.

UNIT-V

Operational Amplifiers: Ideal op-amp, Output offset voltage, input bias current, input offset current, slew rate, gainbandwidth product, Inverting and non-inverting amplifier, Differentiator, integrator, Square-wave and triangular- wave generators

TEXTBOOKS:

1. IntegratedElectronics,JacobMillman,ChristosCHalkias,McGrawHillEducation,2nd edition2010
2. Op-Amps&LinearICs–RamakanthA.Gayakwad,PHI,2003

REFERENCEBOOKS:

1. ElectronicDevicesConventionalandcurrentversion-ThomasL.Floyd2015,pearson.
2. J.MillmanandA.Grabel,"Microelectronics",McGrawHillEducation,1988.
3. P.HorowitzandW.Hill,"TheArtofElectronics",CambridgeUniversityPress,1989.
4. .P R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits" John Wiley&Sons,2001.

Course Outcomes

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

1. Analyze the characteristics of different diodes, BJT and its applications.
2. Explain the characteristics of FET and analyze its amplifier circuits.
3. Construct different multistage amplifiers and create the circuits with power amplifiers.
4. Comprehend the fundamental concepts in positive, negative feedback amplifier circuits.
5. Design and analyze Op Amp based circuits.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**									**2**
CO2	**3**	**3**	**2**									**2**
CO3	**3**	**3**	**2**									**2**
CO4	**3**	**3**	**2**									**2**
CO5	**3**	**3**	**2**									**2**

(A400503) ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

(Common to all branches)

L	T	P	C
0	0	2	1

B.Tech (EEE) I Year II Sem

The English Language and Communication Skills (ELCS) Lab focuses on the production and practice of sounds oflanguage and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

English Language and Communication Skills Lab (ELCS) shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab
b. Interactive Communication Skills (ICS) Lab

Listening Skills Objectives

1. To enable students develop their listening skills so that they may appreciate the role in the LSRW skillsapproach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speech of people ofdifferent backgrounds and regions. Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to markstress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional
    - Oral practice
    - Describing objects/situations/people
    - Role play – Individual/Group activities
    - Just A Minute (JAM) Sessions

The following course content is prescribed for the English Language and Communication Skills Lab

Exercise – I

CALL Lab: Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs - Past Tense Marker and Plural Marker- Testing Exercises

ICS Lab: Understand: Spoken vs. Written language- Formal and Informal English. Practice: Ice-Breaking Activityand JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – II

CALL Lab: Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern insentences – Intonation. Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - Testing Exercises.

ICS Lab: Understand: Features of Good Conversation – Strategies for Effective Communication. Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions -Telephone Etiquette.

Exercise – III

CALL Lab: Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI). Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -TestingExercises

ICS Lab: Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding –Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise – IV

CALL Lab: Understand: Listening for General Details. Practice: Listening Comprehension Tests - TestingExercises

ICS Lab: Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication PresentationSkills. Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise – V

CALL Lab: Understand: Listening for Specific Details. Practice: Listening Comprehension Tests - TestingExercises

ICS Lab: Understand: Group Discussion Practice: Group Discussion

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:** The Computer Assisted Language Learning Lab has to accommodate 30 students with 30 systems, with one Master Console, LAN facility and English language learning software for self- study by students. System Requirement (Hardware component): Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications: i) Computers withSuitable Configuration ii) High Fidelity Headphones
2. **Interactive Communication Skills (ICS) Lab :** The Interactive Communication Skills Lab: A Spacious room with movable chairs and audiovisual aids with a Public Address System, a T. V. or LCD, a digital stereo – audio& video system and camcorder etc. Source of Material (Master Copy): • Exercises in Spoken English. Part 1,2,3.CIEFL and Oxford University Press Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus

REFERENCE BOOKS:

1. English Language Communication Skills Lab Manual cum Workbook, (1st edition) ,by Rajesh KumarCengage Learning India Pvt. Ltd, 2022
2. Communicative English - A workbook, (Revised Edition) byShobha, KN &Rayen, J. Lourdes, CambridgeUniversity Press, 2019.
3. Communication Skills: A Workbook. Kumar, (2nd edition) by Sanjay &Lata, Pushp, Oxford UniversityPress, 2019.
4. ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities, (Board of Editors), Orient BlackSwan Pvt. Ltd, 2016
5. English Language Skills: A Practical Approach, Mishra, Veerendra et al., Cambridge University Press,2020.

Course Outcomes:

On completion of the course students will be able to

1. Understand the nuances of English language through audio- visual experience and group activities.
2. Neutralise their accent for intelligibility.
3. Speak with clarity and confidence which in turn enhances their employability skills
4. Students will learn public speaking skills and overcome stage fear.
5. Express clarity of thoughts, capability to hold the discussion with everyone and develop analyticalthinking.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-		**2**	-	-
CO2	-	-	-	-	-	-	-	-	-	**2**	-	-
CO3	-	-	-	-	-	-	-	-	-	**3**	**2**	-
CO4	-	-	-	-	-	-	-	-	-	**3**	-	**2**
CO5	-	-	-	-	-	-	-	-	-	**2**	-	**2**

(A400501)APPLIED PHYSICS LAB

L	T	P	C
0	0	3	1.5

B.Tech (EEE) I Year II Sem

Any 8 experiments are to be performed)

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. a) V-I and L-I characteristics of light emitting diode (LED)b)V-I Characteristics of solar cell
6. Determination of Energy gap of a semiconductor.
7. Determination of the resistivity of semiconductor by two probe method.
8. Study of B-H curve of a magnetic material.
9. Determination of dielectric constant of a given material
10. a) Determination of the beam divergence of the given LASER beam) Determination of Acceptance Angle
11. Understanding the method of least squares – torsional pendulum as an example.
12. Diffraction grating: Determination of wavelength of a source (LASER).

LABORATORY MANUAL:

1. Applied Lab (2nd Edition) Dr M Chandra Shekhar Reddy, Dr NeelimaPatnaik, Jaya Prakash Reddy Kasu,Skytech Publications, 2022.
2. "A Text book of Practical Physics"(2nd Edition) - S. Balasubramanian, M.N. Srinivasan S Chand Publishers,2017.

COURSE OUTCOMES

On completion of the course students will be able to

1. Appreciate quantum physics in optoelectronics.
2. Determine the Planck's constant using Photo electric effect
3. Determine energy gap of a semiconductor diode and magnetic fields.
4. Identify the material whether it is n-type or p-type by Hall experiment.
5. Evaluate the basic properties of lasers and optical fibers.

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

(A404503) ANALOG ELECTRONIC CIRCUITS LABORATORY

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

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

1. Draw the VI Characteristics of given PN Junction diode. Determine the Static and Dynamic resistance of the Diode.
2. Determine the Ripple factor, % Regulation PIV and TUF of the given Rectifier with &without filter.
3. Obtain the I/O Characteristics of CE configurations of BJT. Calculate h-parameters from the Characteristics.
4. Obtain the I/O Characteristics of CB configurations of BJT. Calculate h-parameters from the Characteristics.
5. Obtain the I/O Characteristics of CC configurations of BJT. Calculate h-parameters from the Characteristics.
6. Obtain the Drain and Transfer characteristics of CD, CS configuration of JFET. Calculategm, rd from the Characteristics Adder and Subtract or using Op Amp.
7. Inverting and Non-inverting Amplifiers using Op Amps
8. Adder and Subtract or using Op Amp
9. Integrator Circuit using IC741.
10. Differentiator circuit using Op Amp.
11. Voltage Shunt Feed back amplifier
12. Design an RC phase shift oscillator circuit and derive the gain condition for oscillations practically for given frequency.
13. Design a Colpitts oscillator circuit for the given frequency and draw the output wave form.
14. Design transformer coupled class A power amplifier and draw the input and outputwaveforms ,find its efficiency

Course Outcomes

Upon completing this course, the student will be able to

1. Know the characteristics, utilization of various components.
2. Understand the biasing techniques
3. Design and analyze various rectifiers, small signal amplifier circuits.
4. Design sinusoidal and non-sinusoidal oscillators.
5. Design OP-AMP based circuits with linear integrated circuits

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**									**2**
CO2	**3**	**3**	**2**									**2**
CO3	**3**	**3**	**2**									**2**
CO4	**3**	**3**	**2**									**2**
CO5	**3**	**3**	**2**									**2**

(A400506) ENGINEERING EXPLORATION & PRACTICE

(Common to all branches)

L	T	P	C
0	0	3	1.5

Week-1

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. Significance of teamwork, Importance of communication in engineering profession

Week-2

Engineering Design Process, Need statement to Problem conversion, Pair wise comparison chart, decision matrix,Concepts of reverse engineering

Week-3

Project management tools: Checklist, Timeline, Gantt chart, Requirement Analysis

Week-4

Basic Components of a Mechanism, Degrees of Freedom or Mobility of a Mechanism, 4 Bar Chain, Crank RockerMechanism, Slider Crank Mechanism

Week-5

3-D Modelling of a Box with two holes and curvature

Week-6

3-D Modelling of Electronic Enclosure and Assembly of two parts

Week-7

Introduction to various platform-based development, Introduction to basic components, transducers, actuators andsensors, Introduction to Tinkercad

Week-8

Introduction to Arduino, basics of programming

Week-9

Interfacing Arduino with actuators and transducers

Week-10

Interfacing Arduino with Sensors, Liquid Crystal Display (LCD)

Week-11

Assembly and Crafting the Prototype

Week-12

Test and Validate the Prototype, Documentation, Panel Presentation

Text Books

1. Engineering Fundamentals: An Introduction to Engineering (MindTap Course List) 5th Edition by SaeedMoaveni
2. Software Project Management (SIE), (Fifth Edition); Bob Hughes,MikeCotterell,Rajib Mall; Published byTata 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. Introduction to autocad®2017-2D and 3D design by Bernd S. Palm and Alf Yarwood, Routledge (Taylor andFrancis group)

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. Create basic 3D models and animations
5. Design a mechatronic system using Arduino and electronic components

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

(A400704) UNIVERSAL HUMAN VALUES

(Common to all branches)

L	T	P	C
2	0	0	0

UNIT - I

Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation-as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment ofaspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living withresponsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based onliking-disliking

UNIT - II

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) • Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT – III

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence • Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals • Visualizing a universal harmoniousorder in society- Undivided Society, Universal Orderfrom family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc., Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

UNIT - IV

Understanding Harmony in the Nature and Existence – Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self- regulationin nature
- Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
- Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT – V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics:
  a. Ability to utilize the professional competence for augmenting universal human order
  b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,
  c. Ability to identify and develop appropriate technologies and management patterns for above productionsystems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. Todiscuss the conduct as an engineer or scientist etc.

Textbooks:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2ndRevised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values andProfessional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019.

Reference Books:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"

Course Outcomes:

On completion of the course students will be able to

1. Students are expected to become more aware of themselves, and their surroundings

(family, society,nature)

2. They would become more responsible in life, and in handling problems with sustainable solutions, whilekeeping human relationships and human nature in mind. •
3. They would have better critical ability about various issues in life.
4. They would also become sensitive to their commitment towards what they have understood (humanvalues, human relationship and human society).
5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-daysettings in real life, at least a beginning would be made in this direction.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	**2**	-	-	-	-	-	-
CO2	-	-	**2**	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	**2**	-	-	-
CO4	-	-	-	-	-	-	-	**2**	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	**2**

(A400007) NUMERICAL METHODS AND COMPLEX VARIABLES

	L	T	P	C
B.Tech. III SEM	**3**	**1**	**0**	**4**

UNIT-I

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-II

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-III

COMPLEX VARIABLES: DIFFERENTIATION

Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne- Thomson's methods, Analytic function, Harmonic function, Finding harmonic conjugate, Conformal mapping and Mobius transformations.

UNIT-IV

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)

.

UNIT-V

FOURIER SERIES & FOURIERTRANSFORMS:

Fourier series - Dirichlet's Conditions - Half-range Fourier series - Fourier Transforms: Fourier Sine and cosinetransforms-Inverse Fourier transforms.

TEXT BOOKS:

1) Higher Engineering Mathematics, (36thEdition), B.S. Grewal, Khanna Publishers, 2010.
2) Advanced EngineerinMathematics,(5thEdition),R.K.JainandS.R.K.Iyengar,NarosaPublications,2016.

REFERENCE BOOKS:

1) Advanced Engineering Mathematics,(9th Edition),Erwinkreyszig,JohnWiley& Sons,2006.
2) Calculus and Analytic geometry, (9thEdition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
3) Introductory methods of Numerical Analysis, (4th Edition), S.S. Sastry, PHI, 2005.

4) Complex Variables and Applications, (7th Edition), J. W. Brown and R. V. Churchill, Mc-Graw Hill, 2004.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Find the root of given equation and estimate unknown value using interpolation.
2. Find numerical solutions of ordinary differential equations.
3. Analyze the complex function with reference to their analyticity.
4. Evaluate integrals using Cauchy's integral and residue theorems, Taylor's and Laurent's series expansionsof complex function.
5. Express any periodic function in terms of sine and cosine.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**										**2**
CO2	**3**	**3**										**2**
CO3	**3**	**3**										**2**
CO4	**3**	**3**										**2**
CO5	**3**	**3**										**2**

(A402203)ELECTRICAL CIRCUIT ANALYSIS – II

B.Tech EEE III SEM

L	T	P	C
2	0	0	2

UNIT-I:

Transient analysis: Transient response of R, L & C circuits, Formulation of integral differential equations, Initial conditions, Transient Response of RL, RC and RLC (series and parallel) networks subjected to internal energy, Response to impulse, step, and ramp, exponential and sinusoidal excitations.

UNIT-II:

Electrical circuit Analysis using Laplace Transforms: Application of Laplace Transforms to RL, RC and RLC (series and parallel) Networks for impulse, step, and ramp, exponential and sinusoidal excitations.

UNIT-III:

Two port network parameters: Open circuit impedance, short-circuit admittance, Transmission, Hybrid parameters & inter-relationships, Series, parallel and cascade connection of two port networks, System function, and Impedanceand admittance functions.

UNIT-IV:

Fourier Series and Integral: Fourier series representation of periodic functions, Symmetry conditions, Exponential Fourier series, Discrete spectrum, Fourier integral and its properties, Continuous spectrum, Application to simple networks

UNIT-V:

Filters: Classification of filters – Low pass, High pass, Band pass and Band Elimination, Constant-kand M-derived filters-Low pass and High pass Filters and Band pass and Band elimination filters(Elementary treatment only)

TEXTBOOKS:

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, "Network Analysis and Synthesis", McGraw Hill, 2nd Edition, 2019

REFERENCE BOOKS:

1. B. Subramanyam, "Electric Circuit Analysis", Dreamtech Press & Wiley, 2021.
2. James W. Nilsson, Susan A.Riedel, "Electric Circuits", Pearson, 11th Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, "Circuits and Networks: Analysis and Synthesis", McGrawHill, 5thEdition, 2017.
4. Jagan N.C, Lakshrninarayana C., "Network Analysis", B.S. Publications, 3rd Edition, 2014.
5. William Hayt H, Kimmerly Jack E. and Steven Durbin M, "Engineering Circuit Analysis", McGrawHill,6th Edition, 2002.
6. Chakravarthy A., "Circuit Theory", DhanpatRai& Co., First Edition, 1999.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Observe the response of various R, L and C circuits for different excitations.

2. Examine the behavior of circuits using Laplace transforms
3. Obtain two port network parameters and applications
4. Examine the behavior of circuits using Fourier transforms and transfer function of single port network.
5. Design of various filters.

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

(A402302) ELECTROMAGNETIC FIELDS

L	T	P	C
3	0	0	3

B.Tech EEE III SEM

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). Analysis of differential volumes, differential surfaces and differential lengths in Rectangular, Cylindrical and Spherical coordinate systems. Conversion of a vectorfrom one coordinate system to another.

UNIT II: STATIC ELECTRIC FIELDS

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) = ρvAbsolute Electric potential, potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy andEnergy 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 infinitesheet 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 Electro magnetics", McGraw Hill Education, 2012.
2. M. N. O. Sadiku, "Elements of Electro magnetics", Oxford University Publication, 2014.

REFERENCE BOOKS:

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 Electro magnetics", Addison-Wesley Educational Publishers, International Edition, 1971.

COURSE OUTCOMES:

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

1. Apply the vector algebra for understanding different coordinate systems
2. Explain the basic laws of electrostatic field.
3. Obtain the electric fields for simple configurations under static conditions.
4. Evaluate static magnetic fields using different laws and explore the forces & torques on variouscurrent distributions
5. Analyze time varying electric and magnetic fields and Express Maxwell's equations in differentforms and different media

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

(A402301) ELECTRICAL MACHINES - I

L	T	P	C
3	0	0	3

B.Tech EEE III SEM

UNIT-I:

D.C. GENERATORS: Principle of operation – Action of commutator – constructional features – armature windings– lap and wave windings – simplex and multiplex windings – use of laminated armature – E. M.F Equation. Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation –reactance voltage – methods of improving commutation. Methods of Excitation – separately excited and self-excited generators – build-up of E.M.F - critical field resistance and critical speed - causes for failure to self-excited and remedial measures. Load characteristics and applications of shunt, series and compound generators.

UNIT-II:

D.C MOTORS: Principle of operation – Back E.M.F. - Torque equation – characteristics and application of shunt, series and compound motors – Armature reaction and commutation.Speed control of D.C. Motors - Armature voltage and field flux control methods.Motor starters (3- point and 4- point starters) Testing of D.C. machines - Losses – Constant &Variable losses –calculation of efficiency – condition for maximum efficiency.

UNIT-III:

TESTING OF DC MACHINES: Methods of Testing – direct, indirect, and regenerative testing – Brake test – Swinburne's test – Hopkinson's test – Field's test - separation of stray losses in a D.C. motor test.

UNIT-IV:

SINGLE PHASE TRANSFORMERS: Types - constructional details-minimization of hysteresis and eddy current losses- EMF equation - operation on no load and on load - phasor diagrams and Applications. Equivalent circuit - losses and efficiency – regulation - All day efficiency - effect of variations of frequency & supply voltage on iron losses.

UNIT-V:

TESTING OF TRANSFORMERS AND POLY-PHASE TRANSFORMERS:

Open Circuit and Short Circuit tests - Sumpner's test - predetermination of efficiency and regulation-separation of losses test parallel operation with equal and unequal voltage ratios - auto transformers-equivalent circuit - comparison with two winding transformers.

Poly-phase transformers – Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ, Scott connection and Applications.

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. Prithwiraj Purkait, Indrayudh Bandyopadhyay, "Electrical Machines", Oxford, 2017.

2. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.
3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013.
4. A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers,2004.

Course Outcomes:

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

1. Describe operation of dc generators for different excitation, starting, speed control methods.
2. Analyze the operation of DC motor.
3. Evaluate the performance of DC machines
4. Examine the operation of single phase transformers.
5. Demonstrate poly phase transformers and their performance through testing.

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

(A402303) POWER SYSTEMS - I
PROFESSIONAL CORE

L	T	P	C
3	0	0	3

B.Tech EEE III SEM

UNIT-I: GENERATION OF ELECTRIC POWER: Structure of Power System, Conventional Sources (Qualitative: Site selection, Layout, Working): Hydro station, Steam Power Plant, Nuclear Power Plant and Gas Turbine Plant.

UNIT-II: OVER HEAD TRANSMISSION LINES: Line conductors, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, Composite conductors transposition, bundled conductors, and effect of earth on capacitance, skin and proximity effects.

OVERHEAD LINE INSULATORS: Introduction, types of insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, testing of insulators, Sag and tension calculations.

UNIT-III: DC DISTRIBUTION: 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 one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor.

UNIT-IV: A.C. DISTRIBUTION: Introduction, AC distribution, Single phase, 3-phase, 3 phase 4 wire system, bus bar arrangement, Selection of site for substation. Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

UNIT-V: ECONOMICS OF POWER GENERATION: Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load duration curve, number and size of generator units. Base load and peak load plants. Cost of electrical energy-fixed cost, running cost, Tariff on charge to customer.

TEXT BOOKS

1. C.L. Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", 2n d Edition,New Age International, 2009.
2. V.K Mehta and Rohit Mehta, "Principles of Power Systems", S. Chand & Company Ltd, NewDelhi, 2004.

REFERENCE BOOKS

1. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Text book on Power System Engineering", DhanpatRai Publishing Company (P) Ltd, 2008
2. C.L. Wadhwa, "Electrical Power Systems", 5th Edition, New Age International, 2009.
3. M.V. Deshpande, "Elements of Electrical Power Station Design", 3rd Edition, Wheeler Pub.1998.
4. H.Cotton& H. Barber, "The Transmission and Distribution of Electrical Energy", 3rd Edition,1970.

5. W.D.Stevenson, “Elements of Power System Analysis”, 4th Edition, McGraw Hill, 1984

COURSE OUTCOMES

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

1. Understand the operation of different types of conventional power plants
2. Illustrate about overhead line insulators
3. Explain DC distribution systems.
4. Explain AC distribution systems.
5. Evaluate the power tariff methods and Economics associated with power generation

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

(A402505) ELECTRICAL MACHINES LABORATORY -I
PROFESSIONAL CORE

L	T	P	C
0	0	2	1

B.Tech EEE III SEM

The following experiments are required to be conducted compulsory experiments:

1. Magnetization characteristics of DC shunt generator (Determination of critical field resistance and criticalspeed)
2. Load test on DC shunt generator (Determination of characteristics)
3. Load test on DC series generator (Determination of characteristics)
4. Hopkinson's test on DC shunt machines (Predetermination of efficiency)
5. Swinburne's test and speed control of DC shunt motor (Predetermination of efficiencies)
6. Brake test on DC compound motor (Determination of performance curves)
7. OC and SC Test on Single Phase Transformer
8. Brake test on DC shunt motor (Determination of performance curves)

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

1. Load test on DC compound generator (Determination of characteristics.
2. Fields test on DC series machines (Determination of efficiency)
3. Retardation test on DC shunt motor (Determination of losses at rated speed)
4. Separation of losses in DC shunt motor.
5. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-PhaseTransformer
6. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)

COURSE OUTCOMES:

On successful 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 different DC motors by brake tests.

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

(A402503)ELECTRICAL CIRCUIT ANALYSIS LABORATORY

L	T	P	C
0	0	2	1

B.Tech EEE III SEM

The following experiments are required to be conducted as compulsory

1. Verification of Series and Parallel Resonance.
2. Determination of Time response of first order RL and RC circuit for periodic non – sinusoidal inputs – Time Constant and Steady state error.
3. Determination of Two port network parameters – Z & Y parameters.
4. Determination of Two port network parameters – A, B, C, D parameters.
5. Determination of Co-efficient of Coupling and Separation of Self and Mutual inductance in a Coupledcircuits.
6. Frequency domain analysis of Low-pass filter.
7. Frequency domain analysis of Band-pass filter.
8. Measurement of Active Power for Star and Delta connected balanced loads

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

1. Measurement of Reactive Power for Star and Delta connected balanced loads.
2. Frequency domain analysis of High-pass filter.
3. Determination of Two port network parameters -Hybrid parameters.
4. Determination of Time response of first order RLC circuit for periodic non – sinusoidal inputs – TimeConstant and Steady state error.
5. To draw the locus Diagrams of RL (R-Varying) and RC (R-Varying) Series Circuits.

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

1. Determine the time response of first order circuits for various inputs.
2. Verify of Series and Parallel Resonance.
3. Determine Z, Y and H, ABCD Parameters of a circuit.
4. Analyse various filter circuits in frequency domain.
5. Determine active power and reactive power for various loads.

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

(A402509)ELECTRICAL SIMULATION TOOLS LABORATORY

L	T	P	C
0	0	2	1

B.Tech EEE III SEM

Suggested List of Laboratory Experiments:

Minimum of 10 experiments to be conducted from the following.

1. Introduction to basic block sets of simulation platforms. Basic matrix operations, Generation of standard test signals
2. Solving the linear and nonlinear differential equations
3. Measurement of Voltage, Current and Power in DC circuits.
4. Verification of different network theorems with dependent and independent sources using suitable simulation tools.
5. Verification of performance characteristics of basic Electronic Devices using suitable simulation tools.
6. Analysis of series and parallel resonance circuits using suitable simulation tools
7. Obtaining the response of electrical network for standard test signals using suitable simulation tools.
8. Modeling and Analysis of Low pass and High pass Filters using suitable simulation tools
9. Performance analysis of DC motor using suitable simulation tools
10. Modeling and analysis of Equivalent circuit of transformer using suitable simulation tools.
11. Analysis of single-phase bridge rectifier with and without filter using suitable Simulation tools.
12. Modeling and Verification of Voltage Regulator using suitable simulation tools.
13. Modeling of transmission line using simulation tools.
14. Performance analysis of Solar PV model using suitable simulation tools

Course Outcomes: After learning the contents of this paper the student must be able to

1. Develop knowledge of software packages to model and program electrical and electronics systems.
2. Model different electrical circuits and analyze the results.
3. Model different electronic systems and analyze the results using different software tools
4. Model and analyse the performance of various electrical equipment using different software tools
5. Articulate importance of software packages used for simulation in laboratory experimentation by analyzing the simulation results.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**3**	1	1				2	1		
CO2	**3**	**3**	**3**	1					2	1		
CO3	**3**	**3**	**3**	1					2	1		
CO4	**3**	**3**	**3**	1	1				2	1		
CO5	**3**	**3**	**3**	1	1				2	1		

(A405506) PYTHON PROGRAMMING LABORATORY

(Common to All)

	L	T	P	C
B.Tech III Semester	**0**	**1**	**2**	**2**

Week 1.

(Python Language Fundamentals-Installation -Identifiers, Reserved Words, Data Types, Type Casting,Immutability)

Demonstration

Experiment-1: Install Anaconda open-source framework for python.

Experiment-2: Write a program to display 'Hello World'.

Experimentation

Experiment-3: Explore various IDEs for python program development.

Experiment-4: The volume of a sphere with radius r is $4/3\ \pi r^3$. Write a Python program to find the volume of asphere with radius 5?

Week 2.

(Arithmetic Operators, Relational Operators, Logical operators, Bitwise operators, Assignment operators, Specialoperators)

Demonstration

Experiment-1; Write a python program to find minimum and maximum of given three numbers.

Experiment-2: Suppose the cover price of a book is $24.95, but bookstores get a 40% discount. Shipping costs $3 for the first copy and 75 cents for each additional copy. Write a python program to computethe total wholesale cost for 60 copies?.

Experimentation

Experiment-3: Write a Python Program to Find the Square Root of a number with out using sqrt function.

Experiment-4: Python Program to Convert Celsius To Fahrenheit.

Experiment-5: Python program to find the maximum of two numbers using ternary operator

Week 3.

(Mathematical Functions, Input and Output statements, Command Line Arguments, String Functions)

Demonstration

Experiment-1: Write a Python program to find area of circle.

Experiment-2: Write a program to read Employee data from the keyboard and print that data.

Experimentation

Experiment-3: Write a program to read 3 float numbers from the keyboard with comma separator and print theirsum.

Experiment-4: Write a Program to display Command Line Arguments.

Week 4.

(Flow Control Statements-Conditional Statements, Transfer Statements, Iterative Statements)

Demonstration

Experiment-1. Write a Python program to take a single digit number from the key board and

print is value inEnglish word?.
Experiment-2. Write a Python Program to check whether an n-digit integer is an Armstrong number or not.

Experimentation

Experiment-3. Write a Python program to display *'s in pyramid style(also known as equivalent triangle).

Experiment-4. Write a Python Program to Display the multiplication Table.

Week 5.

(Functions-Built in functions, user defined functions, Parameters ,return statement, returning multiple values from function, type of arguments, Types of variables-global, local. Recursive functions, Lambda functions, filter function, reduce function, Function aliasing, Function decorators, Generators)

Demonstration

Experiment-1: Write a python function to find factorial of given number?
Experiment-2: Write a program to create a lambda function to find square of given number?

Experimentation

Experiment-3: Lambda Function to find biggest of given values.
Experiment-4:Program to filter only even numbers from the list by using filter() function?

Week 6.

(Working with Strings-Defining String, Multi-line Strings, Accessing characters of a string, Mathematical operatorsfor strings, Membership operator, Comparison of Strings, Removing spaces from the string, Finding Substring, String replacement, Splitting of Strings, Changing cases of a string, Formatting the strings)

Demonstration

Experiment-1: Write a program to accept some string from the keyboard and display its characters by indexwise(both positive and negative index).
Experiment-2: Write a program to access each character of string in forward and backward direction by using whileloop?

Experimentation

Experiment-3: Program to display all positions of substring in a given main string.
Experiment-4: Write a program to reverse the given String.

Week 7.

(Python Data Structures-List: Creating a list-Accessing elements of a List, Traversing the List, List Manipulation, Ordering the elements of a List, Mathematical Operators for List objects, Membership Operator, Nested Lists, List Comprehensions)

Demonstration

Experiment-1:Write a Python program to display unique vowels present in the given word.
Experiment-2: Write a Python program to Count the Occurrence of an Item in a List.

Experimentation

Experiment-3: Write a Python program to segregate even and odd numbers from the given list of numbers.

Experimnet-4: Write a Python program to find the cumulative sum of elements of the list.

Week 8.

(Python Data Structures-Tuple: Creating a Tuple, Accessing the elements of a tuple, mathematical operators fortuple, Tuple packing and Unpacking)

Demonstration

Experiment-1: Python program for adding a Tuple to List and Vice-Versa.

Experiment-2: Write a Python program to perform the summation of all elements of each tuple from the list oftuples.

Experimentation

Experiment-3: Write a Python program to multiply adjacent elements of a tuple.

Experiment-4: Write a Python program to find the maximum element in the tuple list.

Week 9.

(Python Data Structures-Set: Creating a Set object, functions of set, Mathematical operations on set, Membership Operators, Set Comprehension, Python Data Structures-Dictionary: Creating a Dictionary Object, accessing data from the dictionary, updating dictionaries, Deleting from dictionary, Functions on dictionary, dictionary comprehension)

Demonstration

Experiment-1.Write a Python program to perform set operations.

Experiment-2:Write a program to print different vowels present in the given word?

Experiment-3:Write a Python program to generate powers of 2 using set comprehensions.

Experiment-4: Write a program to eliminate duplicates present in the list using set

Experiment-5:Write a Python program to enter name and percentage marks in a dictionary and display informationon the console.

Experimentation

Experiment-6: Write a program to take dictionary from the keyboard and print the sum of values?

Experiment-7: Write a program to find number of occurrences of each letter present in the given string usingdictionary.

Experiment-8: Write a program to accept student name and marks from the keyboard and creates a dictionary. Alsodisplay student marks by taking student name as input?

Week 10.

(Python Modules-Creating Modules, Accessing members, module aliasing,member aliasing,reloading a module, The special variable: __name_____. Working with Math,random modules, Python Packages.Python-File Handling-Types of Files, Opening a file, closing a file, properties of File object, writing data to text file, Reading character data from text files, seek (), tell() functions.)

Demonstration

Experiment-1:Create a module **fibo.py** containing Fibonacci(**n**) function(s) and import fibo module in a pythonscript to print Fibonacci series upto **n**.

Experiment-2: Write a python program to print all the contents of a given module.
Experiment-3:Write a python program to create a package containing two or modules.
Experiment-4: Write a python program to import module from a package created in Experiment-3.

Experimentation

Experiment-5: Write a program to check whether the given file exists or not. If it is available then print its content?
Experiment-6: Write a python Program to print the number of lines,words and characters present in thegiven file?
Experiment-7: Program to read image file and write to a new image file?

Experiment-8: Write a python program to read and write to a CSV file.
Note:
Experiments under Demonstration section are to be demonstrated by the concerned faculty and the experimentsunder Experimentation section must be performed by the students individually.

Reference Books:

1. Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.
2. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.
3. Kenneth A. Lambert, B.L. Juneja, "Fundamentals of Python", CENGAGE, 2015.
4. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019.

Web links:

1. https://docs.python.org/3/tutorial/modules.html#packages
2. https://www.includehelp.com/python/programs.aspx.
3. https://www.anaconda.com/products/individual
4. https://www.jetbrains.com/pycharm/

Course Outcomes

Students shall be able to:

1) Design solutions to computational problems using Python programming language constructs.
2) Write python programs to manipulate string objects.
3) Use appropriate Data structures to organize and manipulate data items.
4) Design modular application using python module & package concepts.
5) Develop application to read and write from various file formats.

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

(A400702)GENDER SENSITIZATION

L	T	P	C
2	0	0	0

B.Tech EEE III SEM

Unit-I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender- Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

Unit – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. DemographicConsequences-Gender Spectrum: Beyond the Binary

UNIT – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn"t Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. –Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

UNIT – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No!-Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "Chupulu". Domestic Violence: Speaking OutIs Home a Safe Place? –When WomenUnite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life…."

UNIT – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature GenderDevelopment Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature – Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters- Mothers and Fathers- Rosa ParksThe Brave Heart.

REFERENCE BOOKS

1. Towards a World of Equals: A Bilingual Textbook on Gender, A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu published by Telugu Akademi, Telangana Government, 2015.

Course Outcomes:

On completion of the course students will be able to

1. Students will have developed a better understanding of important issues related to gender in contemporaryIndia.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. (This will be achieved through discussion of materials derived from research, facts,everyday life, literature and film).

3. Students will attain a finer grasp of how gender discrimination works in our society and acquire insightinto the gendered division of labour and its relatuion to politics and economics.
4. Men and women students and professionals will be better equipped to work and live together as equals.
5. Students will develop a sense of appreciation of women in all walks of life by going through accounts ofstudies and movements as well as the new laws that provide protection and relief to women.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	**2**	-	-	-	-	-	-
CO2	**2**	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	**2**	-	-	-	-	-	-
CO4	-	-	-	**2**	-	-	-	-	-	-	-	-
CO5	-	-	**3**	-	-	--	-	-	-	-	-	-

(A401201)FLUID MECHANICS & HYDRAULIC MACHINERY

L	T	P	C
3	0	0	3

B.Tech (EEE) IV-Semester

UNIT – I:

Fluid statics: Dimensions and units: physical properties of fluids- specific gravity, viscosity, and surface tension - vapour pressure and their influence on fluid motion- atmospheric, gauge and vacuum pressures – measurement of pressure- Piezometer, U-tube and differential manometers.

UNIT – II:

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

Fluid Dynamics: Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT – III:

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

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.

Measurement of flow: Pitot tube, venturi meter, and orifice meter, Flow nozzle

UNIT – IV:

Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes. Hydraulic Turbines: 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.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge tank, water hammer.

UNIT – V:

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 - Modi and Seth, 21st Edition, standard Book House.
2. Fluid Mechanics and Hydraulic Machines by Er. R. K. Rajput, S. Chand,2019.

REFERENCE BOOKS:

1. Fluid mechanics and fluid power engineering by d.s. kumar, s.k. kataria & sons,2018

2. Fluid mechanics and machinery by d. rama durgaiah, new age international publishers
3. Hydraulic machines by t.r.banga & s.c. sharma, 7 th edition, khanna publishers

Course Outcomes: At the end of the Course, student will be

1. Able to explain the effect of fluid properties on a flow system.
2. Able to identify type of fluid flow patterns and describe continuity equation.
3. Able to analyze a variety of practical fluid flow and measuring devices and utilize Fluid Mechanics principles in design.
4. Able 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 Reciprocating pump.

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

(A402308) POWER SYSTEMS-II

PROFESSIONAL CORE

L	T	P	C
3	0	0	3

B.Tech EEE IV SEM

UNIT - I: PERFORMANCE OF LINES: Representation of lines, short transmission lines, medium length lines, nominal T and PI- representations, long transmission lines. The equivalent circuit representation of a long Line, A, B, C, D constants, Ferranti Effect. Corona: Introduction, disruptive critical voltage, corona loss, Factors affecting corona loss and methods of reducing corona loss, Disadvantages of corona, interference between power and Communication lines.

UNIT-II: Mechanical Design of Transmission Lines

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

Sag and Tension Calculations: Sag and Tension, Calculations with equal and unequal heights of towers, Effect ofWind and Ice on weight of Conductor, Numerical Problems -Stringing chart and sag template and its applications

UNIT-III: VOLTAGE CONTROL & POWER FACTOR IMPROVEMENT: Introduction – methods of voltage control, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers, power factor improvement methods.

TRAVELLING WAVES ON TRANSMISSION LINES: Production of travelling waves, open circuited line, short-circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at T- junction line terminated through a capacitance, capacitor connection at a T-junction, Attenuation of travelling waves.

UNIT-IV: COMPENSATION IN POWER SYSTEMS: Introduction - Concepts of Load compensation – Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrical line – Radial line with asynchronous load – Compensation of lines.

PER UNIT REPRESENTATION OF POWER SYSTEMS: The one-line diagram, impedance and reactance diagrams, per unit quantities, changing the base of per unit quantities, advantages of per unit system.

UNIT-V: SYMMETRICAL COMPONENTS AND FAULT CALCULATIONS: Significance of positive,negative and zero sequence components, Average 3-phase power in terms of symmetrical components, sequence impedances and sequence networks, fault calculations, sequence network equations, single line to ground fault, line to line fault, double line to ground fault, three phase fault, faults on power systems, faults with fault impedance, reactors and their location, short circuit capacity of a bus.

TEXT BOOKS:

1. C.L. Wadhwa, "Electrical Power Systems", New Age International Pub. Co, Third Edition, 2001.
2. D.P. Kothari and I.J. Nagrath, "Modern Power System Analysis", Tata McGraw Hill Pub. Co. New Delhi,Fourth edition, 2011.

REFERENCE BOOKS:

1. A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Text book on Power System Engineering",DhanpatRai Publishing Company (P) Ltd, 2008.
2. John J. Grainger & W.D. Stevenson, "Power System Analysis", McGraw Hill International,1994.
3. HadiScadat, "Power System Analysis", Tata McGraw Hill Pub. Co. 2002.
4. W.D. Stevenson, "Elements of Power system Analysis", McGraw Hill International Student Edition.

Course Outcomes: **After completion of the course student must be able to**

1. Analyze transmission line performance
2. Explain the Mechanical Design of Transmission Lines
3. Understand the concept of voltage control and power factor improvement.
4. Understand the application of per unit quantities in power systems and apply load Compensation techniques to control reactive power.
5. Determine the fault currents for symmetrical and unbalanced faults.

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

(A404205) SWITCHING THEORY AND LOGIC DESIGN

L	T	P	C
2	0	0	2

B. Tech. (EEE) IV-Semester

UNIT-I

Number Systems: Number systems, Complements of Numbers, Codes- Weighted and Non-weighted codes and its Properties, Parity check code and Hamming code.

Boolean algebra: Basic Theorems and Properties, Switching Functions- Canonical and Standard Form, Algebrai c Simplification, Digital Logic Gates, EX-OR gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT-II

Minimization of Boolean functions: Karnaugh Map Method - Up to five Variables, Don't Care Map Entries, Tabular Method

Combinational Logic Circuits: Adders ,Subtractors, Comparators, Multiplexers, De multiplexers, Encoders, Decoders and Code converters,.

UNIT-III

Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR,JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops,Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

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UNIT-IV

Registers and Counters: Shift Registers – Left, Right and Bidirectional Shift Registers, Applications of Shift Registers-Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

Sequential Machines: Finite State Machines, Synthesis of Synchronous Sequential Circuits-Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N – Counters.

UNIT-V

Finite state machine: capabilities and limitations, Mealy and Moore models, State equivalence and machine minimization, simplification of in completely specified machines, Merger graphs.

TEXTBOOKS

1. Zvi Kohavi & NirajK. Jha,- SwitchingandFiniteAutomataTheory,3rd Ed.,Cambridge, 2010.
2. DigitalDesign-MorrisMano,PHI,3rdEdition,2006.

REFERENCEBOOKS

1. R. P.Jain-ModernDigitalElectronics,3rdEdition,2007- TataMcGraw-Hill
2. CharlesH.Roth-FundamentalsofLogicDesign,5thED.,Cengage Learning,2004.

Course Outcomes

Upon Completion of the Course, Students will be able to

1. Identify and differentiate the various number systems and number conversions.
2. Apply the basic theorems to simplify the Boolean Functions.
3. Design various digital applications with combinational circuits.
4. Design various digital applications with combinational circuits and sequential circuits.
5. Distinguish the Moors and Mealy models in Finite State Machines.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**									**2**
CO2	**3**	**3**	**2**									**2**
CO3	**3**	**3**	**2**									**2**
CO4	**3**	**3**	**2**									**2**
CO5	**3**	**3**	**2**									**2**

(A402304) ELECTRICAL MACHINES – II

PROFESSIONAL CORE

L	T	P	C
3	0	0	3

B.Tech EEE IV SEM

UNIT-I:

POLY-PHASE INDUCTION MACHINES: Constructional details of cage and wound rotor machines productionof a rotating magnetic field - principle of operation - rotor EMF and rotor frequency – rotor reactance, rotor current and Power factor at standstill and during operation. Rotor power input, rotor copper loss and mechanical power developed and their inter relation.

UNIT-II:

CHARACTERISTICS OF INDUCTION MACHINES: Torque equation-expressions for maximum torque and starting torque - torque slip characteristic - equivalent circuit - phasor diagram - crawling and cogging, No-load Testand Blocked rotor test –Predetermination of performance-Methods of starting and starting current and Torque calculations, Applications.

SPEED CONTROL METHODS: Change of voltage, change of frequency, voltage/frequency, injection of an EMFinto rotor circuit (qualitative treatment only)-induction generator-principle of operation.

UNIT-III:

SYNCHRONOUS MACHINES: Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings – distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated e.m.f. – suppression of harmonics – armature reaction leakage reactance – synchronous reactance and impedance –experimental determination - phasor diagram – load characteristics. Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods –salient pole alternators – two reaction analysis – experimental determination of Xd and Xq (Slip test)Phasor diagrams – Regulation of salient pole alternators.

UNIT-IV:

PARALLEL OPERATION OF SYNCHRONOUS MACHINES:

Synchronizing alternators with infinite bus bars – synchronizing power torque – parallel operation and load sharing Effect of change of excitation and mechanical power input. Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactance's and Applications.

SYNCHRONOUS MOTORS: Theory of operation – phasor diagram – Variation of current and power factor withexcitation – synchronous condenser – Mathematical analysis for power developed. – Hunting and its suppression – Methods of starting – synchronous induction motor.

UNIT-V:

SINGLE PHASE MACHINES: Single phase induction motor – Constructional Features-Double revolving field theory – split-phase motors – AC series motor- Universal Motor- -Shaded pole motor and Applications.

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. Prithwiraj Purkait, Indrayudh Bandyopadhyay, “Electrical Machines”, Oxford, 2017.
2. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.
3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013.
4. A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers,2004

Course Outcomes:

By the end of the course students will be able to

1. Explain the operation of poly phase Induction Machine and its performance characteristics of InductionMotor
2. Analyze performance characteristics of ac machines.
3. Explain constructional features, types, operation of synchronous machines
4. Examine the parallel operation of synchronous machines.
5. Illustrate the operation of different types of single phase induction motor and special motors

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

(A402307) MEASUREMENTS AND INSTRUMENTATION

PROFESSIONAL CORE

L	T	P	C
3	0	0	3

B.Tech EEE IV SEM

UNIT - I: INTRODUCTION TO MEASURING INSTRUMENTS: Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflectingtorque 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: POTENTIOMETERS & INSTRUMENT TRANSFORMERS: 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. CT and PT – Ratio and phase angle errors

UNIT-III: MEASUREMENT OF POWER & ENERGY: 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. 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 – tri-vector meter, maximum demand meters.

UNIT-IV: DC & AC BRIDGES: 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. Measurement of inductance- Maxwell's bridge, Hay's bridge, Anderson's bridge - Owen's bridge. Measurement of capacitance and loss angle –Desaunty's Bridge - Wien's bridge – ScheringBridge.

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; LVDTApplications, Strain gauge and its principle of operation, gauge factor, Thermistors, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, and photo diodes.

INTRODUCTION TO SMART AND DIGITAL METERING: Digital Multi-meter, True RMS meters, Clamp- on meters, Digital Energy Meter, Cathode Ray Oscilloscope, Digital Storage Oscilloscope.

TEXTBOOKS:

1. A. K. Sawhney, "Electrical & Electronic Measurement & Instruments", DhanpatRai& Co. Publications,2005.
2. Dr. Rajendra Prasad, "Electrical Measurements & Measuring Instruments", Khanna Publishers 1989.

REFERENCE BOOKS:

1. G. K. Banerjee, "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2 nd Edition, 2016.

2. R. K. Rajput, "Electrical & Electronic Measurement & Instrumentation", S. Chand and Company Ltd.,2007.
3. S. C. Bhargava, "Electrical Measuring Instruments and Measurements", BS Publications, 2012.
4. Buckingham and Price, "Electrical Measurements", Prentice – Hall, 1988.
5. Reissland, M. U, "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1 st Edition 2010.
6. E.W. Golding and F. C. Widdis, "Electrical Measurements and measuring Instruments", fifthEdition,Wheeler Publishing, 2011.

Course Outcomes:

After completion of the course the student must be able to

1. Understand different types of measuring instruments, their construction,
2. Explain the operation and characteristics and identify the instruments suitable for typical measurements
3. Elucidate the measurement of voltage, current, Power factor, power and energy
4. Illustrate operation of various bridges
5. Apply the knowledge about transducers and instrument transformers to use them effectively and alsosmart and digital metering for industrial applications.

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

(A402508) MEASUREMENTS AND INSTRUMENTATION LABORATORY

L	T	P	C
0	0	2	1

B.Tech EEE IV SEM

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 - Phase reactive power with single-phase wattmeter.
8. Measurement of Parameters of choke coil using 3 voltmeter and 3 ammeter method

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

1. Calibration of LPF wattmeter – by Phantom testing.
2. Measurement of 3-phase power with single watt meter and two CTs.
3. C.T. testing using mutual Inductor – Measurement of % ratio error and phase angle of given CT by Nullmethod.
4. PT testing by comparison – V. G. as Null detector – Measurement of % ratio error and phase angle of thegiven PT
5. Resistance strain gauge – strain measurements and Calibration.
6. Measurement of displacement with the help of LVDT.

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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**		2	2				2		2	**3**
CO2	**3**	**3**		2	2				2		2	**3**
CO3	**3**	**3**		2	2				2		2	**3**
CO4	**3**	**3**		2	2				2		2	**3**
CO5	**3**	**3**		2	2				2		2	**3**

(A404510) SWITCHING THEORY AND LOGIC DESIGN LABORATORY

L	T	P	C
0	0	2	1

B. Tech. (EEE) IV-Semester

List of Experiments:

1. Realization of given Boolean function using universal gates and minimizing the same. Compare the gate count before and after minimization.
2. Design and realize Full Adder circuit using gates/universal gates. Implement Full Subtractor using full adder.
3. Realize 4-bit Magnitude Comparator.
4. Realize2:1MUXusing the given gates and Design 8:1 using 2:1 MUX.
5. Realize a 2x4 Decoder using logic gates and implement 3x8 Decoder using 2x4 Decoder.
6. Implement the given Boolean function using given Decoders.
7. Verification of truth tables of flip flops using different clocks (level triggering, positive and negative edge triggering) also converts the given flip flop from one type to other.
8. Designing of Universal n-bit shift register using flip flops and Multiplexers. Draw the timing diagram of the Shift Register.
9. Design a Synchronous binary counter using D-flip flop/given flipflop
10. Design Asynchronous counter for the given sequence using given flipflops.
11. Designing of MOD 8 Counter using JK flipflops.
12. Designing of sequence detecting State Machine with minimal states using the given flipflops.

TEXTBOOKS:

1. A.Kumar,"Fundamentals of Digital Circuits",Prentice Hall India,2016.
2. M.M.Mano,"Digital logic and Computer design",Pearson Education India,2016.

REFERENCEBOOKS:

1. R.S.Sedha,“A Text book of Digital Electronics”,S.Chand, 2005
2. R.P.Jain,"Modern Digital Electronics", McGrawHillEducation,2009.

Course Outcomes

Upon completing this course, the student will be able to

1. Identify the various logic gates, logic families and also working principles.
2. Design and implement Combinational and Sequential logic circuits.
3. Analyze different types of semi conductor memories
4. Compare various types of registers for storage.
5. Design and verify various Flip Flops operations.

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

(A402506) ELECTRICAL MACHINES LABORATORY– II

PROFESSIONAL CORE

L	T	P	C
0	0	2	1

B.Tech EEE IV SEM

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

1. Sumpner's test on a pair of single-phase transformers
2. No-load & Blocked rotor tests on three phase Induction motor
3. Regulation of a three –phase alternator by synchronous impedance &m.m.f. methods
4. 'V' and 'Inverted V' curves of a three—phase synchronous motor.
5. Equivalent Circuit of a single-phase induction motor
6. Determination of Xd and Xq of a salient pole synchronous machine
7. Brake test on three phase Induction Motor
8. Regulation of three-phase alternator by Z.P.F. method

In addition to the above eight experiments, at east any two of the following experiments are required to beconducted from the following list:

1. Separation of core losses of a single-phase transformer
2. Efficiency of a three-phase alternator
3. Parallel operation of Single-phase Transformers
4. Heat run test on a bank of 3 Nos. of single-phase Delta connected transformers
5. Measurement of sequence impedance of a three-phase alternator.
6. Scott Connection of transformer

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

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

(A400507)SOCIAL INNOVATION IN PRACTICE
(Common for all branches)

L	T	P	C
0	0	2	1

B.Tech EEE IV SEM

Week-1

Identify community issues to be addressed, Requirements Analysis: Extensive User requirements analysis

Week-2

Generating effective System Requirement document

Week-3

Social Innovation – Case Studies

Week-4

Impact of Social Innovation on communities

Week-5

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

Week-6

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

Week-7

Introduction to sustainability, Sustainability leadership, Life cycle assessment

Week-8

Carbon footprint Calculation

Week-9

Types of Start-Ups, Types of business models, Market risks and Marketing strategies

Week-10

Verification of Business Model and Validation

Week-11

Business Model Development

Week-12

Documentation and Panel presentation

Reference Books

1. Requirements Analysis: From Business Views to Architecture; David C. Hay; Prentice Hall Professional
2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, YeheskelHasenfeld; PalgraveMacmillan
3. Social Enterprise Law: Trust, Public Benefit and Capital Markets By Dana Brakman Reiser & Steven A. Dean
4. Introduction to Sustainability by Robert Brinkmann, Wiley-Blackwell

Course Outcomes

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

1. Identify several social issues to be addressed
2. Analyse the impact of social innovations on the society
3. Illustrate the process of social innovation for a community problem
4. Demonstrate the solution from sustainability perspectives.

5. Develop a scalable business model.

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

(400701)ENVIRONMENTAL SCIENCES
(Common to All Branches)

L	T	P	C
2	0	0	0

B.Tech EEE IV SEM

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 surfaceand 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, aestheticand 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, Globalwarming, 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 andrehabilitation of people: problems and concerns, Rain water harvesting, cloud seeding and watershed management. Economy and Environment, The economy and environment interaction, Economics of development, preservation and conservation, Sustainability: theory and practices, Limits to growth , Equitableuse of resources for sustainable life styles, Environmental Impact Assessment.

Text Books

1. Environmental Science (1st edition), Y.Anjaneyulu, B S Publications.
2. Environmental studies (1st edition), Deekshadave, Cengage learning India Pvt. Ltd.

Reference books

1. Environmental sciences and Engineering (1st edition), P. Venugopal Rao, PHI learning Pvt. Ltd.,
2. Environmental Science and Technology (1st edition), M. Anji Reddy, B S Publications.
3. Clark, R.S., Marine Pollution, Clanderson Press, Oxford, 2002.
4. Environmental Encyclopedia (Cunningham, W.P., et al., 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

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1			2				3					**1**
CO2			2				3					**1**
CO3			2				3					**1**
CO4			2				3					**1**
CO5			2				3					**1**

(A402306) POWER ELECTRONICS

B. Tech. (EEE) V-Semester

L	T	P	C
3	1	0	4

Prerequisite: Analog Electronics, Digital Electronics

Course Objectives:

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

UNIT-I: POWER SWITCHING DEVICES

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

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

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

UNIT-III: DC-DC CONVERTERS (CHOPPER)

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

UNIT-IV: DC-AC CONVERTERS (INVERTERS)

Introduction, principle of operation, performance parameters, single phase bridge inverters with R, RL loads, 3-phase bridge inverters - 120- and 180-degrees mode of operation, Voltage control of single-phase inverters –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-phase voltage controller for R, R-L loads and its applications. Cyclo-converter-Principle of operation of single phase cyclo-converters, relevant waveforms, circulating current mode of operation, Advantages and disadvantages.

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 students can be able to

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

(A402305) CONTROL SYSTEMS

B. Tech. (EEE) V-Semester

L	T	P	C
3	1	0	4

Prerequisite: Matrix Algebra and Calculus, Applied and Multivariable Calculus, Numerical Methods and Complex Variables, Fundamental physical laws

Course objectives:

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

UNIT – I: INTRODUCTION

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

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

UNIT-II: TIME RESPONSE ANALYSIS

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

UNIT – III: STABILITY ANALYSIS

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

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

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

UNIT - IV: STABILITY ANALYSIS IN FREQUENCY DOMAIN:

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

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

UNIT – V: STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and its Properties. Concept of controllability and observability

TEXTBOOKS:

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, 3rdEdition, 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 students can 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.

(A402312) MICROPROCESSORS & MICROCONTROLLERS

B. Tech. (EEE) V-Semester

L	T	P	C
3	0	0	3

Prerequisite:

UNIT-I:

8086 Architecture-Pin diagram, Register Organization, Memory Segmentation, Programming Model, Modes of operation, Timing diagrams, Memory addresses, Physical Memory Organization, interrupts of 8086. Instruction Set and Assembly Language Programming of 8086: Instruction formats, addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations, Software Debugging tools, MDS.

UNIT-II:

I/O Interface: 8255 PPI, Various modes of operations and interface of I/O devices to 8086, A/D, D/A Converter Interfacing. Interfacing with Advanced Devices: 8086 System bus structure, Memory and I/O Interfacing with 8086, Interfacing through various IC Peripheral Chips, 8257 (DMA Controller), 8259 (Interrupt Priority Control).

UNIT-III:

Communication Interface: Serial Communication Standards, USART Interfacing RS-232, IEEE-488, 20mA Current Loop, Prototyping and Troubleshooting,

UNIT-IV:

Introduction to Micro Controllers: Overview of 8051 Micro Controller, Architecture, I/O ports and Memory Organization, addressing modes and Instruction set of 8051, Simple Programs using Stack Pointer, Assembly language programming of 8051 Interrupts Communication: Interrupts - Timer/Counter and Serial Communication, Interrupt Priority in the 8051, Programming of 8051- Timers, Counters and Interrupts.

UNIT-V:

Interfacing and Industrial Applications: Applications of Micro Controllers, interfacing 8051 to LED's, Keyboard Interfacing, Interfacing Seven Segment Display, ADC and DAC Interfacing, Stepper Motor Interfacing

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, MHE, 2nd Edition 2006.
2. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed.

REFERENCE BOOKS:

1. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012
2. Microprocessors and Interfacing, D. V. Hall, MGH, 2nd Edition 2006.
3. Introduction to Embedded Systems, Shibu K.V, MHE, 2009
4. The 8051 Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.

Course Outcomes:

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

(A402309) POWER SYSTEM PROTECTION

B. Tech. (EEE) V-Semester

L	T	P	C
3	0	0	3

Pre-requisites: Power Systems-I, Power Systems-II

Course Objectives:

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

UNIT - I: INTRODUCTION TO CIRCUIT BREAKERS

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

UNIT – II: ELECTROMAGNETIC AND STATIC RELAYS

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

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

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. Numerical Problems on % Winding Unprotected. Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CT s Ratio, Buchholtz relay Protection. Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay.

Protection of Bus bars – Differential protection.

PILOT RELAYING SCHEMES

Pilot Wire protection, Carrier current protection.

UNIT – IV: NEUTRAL GROUNDING

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

UNIT - V: PROTECTION AGAINST OVER VOLTAGES

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

Course Outcomes:

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

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

(A402401) SIGNALS & SYSTEMS
Professional Elective-I

B. Tech. (EEE) V-Semester

L	T	P	C
3	0	0	3

Course Objectives:

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.

Textbooks

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

After successful completion of this course, the students can 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.

(A402402) UTILIZATION OF ELECTRICAL ENERGY
Professional Elective-I

B. Tech. (EEE) V-Semester

L	T	P	C
3	0	0	3

Pre-requisites: Electrical Machines-I and Electrical Machines-II
Course Objective:

- To understand the fundamentals of illumination and its classification
- To describe the electric heating and welding.
- To have a 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.

TEXTBOOKS

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:

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

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

(A402403) OPTIMIZATION TECHNIQUES

Professional Elective-I

B. Tech. (EEE) V-Semester

L	T	P	C
3	0	0	3

Pre-requisites

Course Objectives:

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

UNIT-I: INTRODUCTION AND CLASSICAL OPTIMIZATION TECHNIQUES

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

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

UNIT-II: LINEAR PROGRAMMING

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

TRANSPORTATION PROBLEM: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.

UNIT-III: UNCONSTRAINED NONLINEAR PROGRAMMING

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

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

UNIT-IV: CONSTRAINED NONLINEAR PROGRAMMING

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

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

UNIT-V: DYNAMIC PROGRAMMING

Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

TEXTBOOKS:

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 students can 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.

(A402512) MICROPROCESSORS & MICROCONTROLLERS LABORATORY

B. Tech. (EEE) V-Semester

L	T	P	C
0	0	2	1

The following programs/experiments are to be written for assembler and to be executed the same with 8086 and 8051 kits.

List of Experiments:

1. Programs for 16-bit arithmetic operations 8086(using various addressing modes)
2. Programs for sorting an array for 8086.
3. Programs for searching for a number of characters in a string for 8086.
4. Programs for string manipulation for 8086.
5. Programs for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessor kits using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
10. Programming using arithmetic, logical and bit manipulation instructions of 8051.
11. Program and verify Timer/Counter in 8051.
12. Program and verify interrupt handling in 8051.
13. UART operation in 8051.
14. Communication between 8051 kit and PC
15. Interfacing LCD to 8051
16. Interfacing Matrix/Keyboard to 8051
17. Data transfer from peripheral to memory through DMA controller 8237/8257

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, MHE, 2nd Edition 2006.
2. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed.

REFERENCE BOOKS:

1. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012
2. Microprocessors and Interfacing, D. V. Hall, MGH, 2nd Edition 2006.
3. Introduction to Embedded Systems, Shibu K.V, MHE, 2009
4. The 8051 Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.

(A402507) POWER ELECTRONICS & SIMULATION LAB

B. Tech. (EEE) V-Semester

L	T	P	C
0	0	2	1

Prerequisite: Power Electronics

Course Objective:

- To construct converters and choppers for different applications using power semiconductor devices.
- To analyze the function of various converters by means of MATLAB and PSPICE simulation.

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:

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

1. Experiment with the working of different converters like AC-AC, AC-DC & DC-AC.
2. **Analyse** the characteristics of SCR, MOSFET & IGBT
3. Apply the turn on and turn off methods of **SCRs.**
4. Develop circuit for converting one particular frequency signal into different frequency signals.
5. Simulate and code programs in PSPICE for different power electronic **converters.**

(A402510) CONTROL SYSTEMS & SIMULATION LABORATORY

B. Tech. (EEE) V-Semester

L	T	P	C
0	0	2	1

Prerequisite: Control Systems
Course Objective:

- To develop different controlling techniques in open loop and closed loop systems.
- To simulate different frequency response plots using MATLAB

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, at least 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 Synchro's

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

1. Apply various time domain and frequency domain techniques to assess the system performance.
2. Build the transfer function of DC machines.
3. Analyze the characteristics of magnetic amplifiers and AC servo motor.
4. Choose a suitable controller for a specific application.
5. Analyze the Stability of Linear Time Invariant system using MATLAB.

(A400705) INTELLECTUAL PROPERTY RIGHTS

B. Tech. (EEE) V-Semester

L	T	P	C
2	0	0	2

Course Objective: The Objective of the course is to have the basic concepts of Intellectual Property Rights through which a firm/individual can protect its existence through its uniqueness.

UNIT-I: INTRODUCTION TO INTELLECTUAL PROPERTY: Introduction, types of intellectual property, international Organizations, agencies and treaties, importance of intellectual property rights.

UNIT-II: TRADEMARKS: Purpose and function of trademarks, acquisition of trademark rights, protectable matter, Selecting and evaluating trademark, trade mark registration processes.

UNIT-III: LAW OF COPY RIGHTS: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right owner ship issues, copy right registration, notice of copy right , international copy right law.

Law of Patents: Foundation of patent law, patent searching process, owner rights and transfer.

UNIT-IV: TRADE SECRETS: Trade secret law, determination of trade secrete status' liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

UNFAIR COMPETITION: Misappropriation right of publicity, false advertising

UNIT-V: NEW DEVELOPMENT OF INTELLECTUAL PROPERTY: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international-trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXTBOOKS & REFERENCES

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, Prabuddha Ganguli, Tata Mc Graw Hill Publishing Company Ltd.

COURSE OUTCOMES:

On completion of the course students will be able to:

3. Skill to understand the concept of intellectual property rights.
4. Develops procedural knowledge to Legal System and solving the problem relating Patents.
5. Gain knowledge on development and owning of Trademarks, Copy Rights, and Patents.
6. Develops conceptual exposure on legal aspects related to IPR.
7. Knowledge on different types of competition and ethical and unethical practices of advertising

(A402314) CMOS VLSI DESIGN

B. Tech. (EEE) VI-Semester

L	T	P	C
3	1	0	4

UNIT – I

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS &BiCMOS Basic Electrical Properties: Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, Figure of merit; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT - II

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

UNIT - III

Gate Level Design: Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out.

UNIT - IV

Data Path Subsystems: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters. Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

UNIT – V

Programmable Logic Devices: Design Approach – PLA, PAL, Standard Cells FPGAs, CPLDs. CMOS Testing: CMOS Testing, Test Principles, Design Strategies for test, Chip level Test Techniques

TEXTBOOKS:

1. Digital Design – Third Edition, M. Morris Mano, Pearson Education/PHI.
2. Digital Principles and Applications Albert Paul Malvino Donald P. Leach TATA McGraw HillEdition.
3. Fundamentals of Logic Design, Roth, 5th Edition, Thomson.

REFERENCE BOOKS:

1. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.
2. Switching and Logic Design, C.V.S. Rao, Pearson Education
3. Digital Principles and Design – Donald D. Givone, Tata McGraw Hill, Edition.
4. Fundamentals of Digital Logic and Microcomputer Design, 5TH Edition, M. Rafiquzzaman JohnWiley.

(A402310) POWER SEMICONDUCTOR DRIVES

B. Tech. (EEE) VI-Semester

L	T	P	C
3	0	0	3

Prerequisite: Power Electronics, Electrical Machines – I, Electrical Machines – II

Course Objectives:

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

UNIT-I: CONTROL OF DC MOTORS

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

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

UNIT-II: FOUR QUADRANT OPERATION OF DC DRIVES

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

CONTROL OF DC MOTORS BY CHOPPERS:

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

UNIT-III: STATOR SIDE CONTROL OF INDUCTION MOTOR

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

UNIT-IV: ROTOR SIDE CONTROL OF INDUCTION MOTOR

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

UNIT-V: CONTROL OF SYNCHRONOUS MOTORS

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

TEXTBOOKS:

1. "G K Dubey", Fundamentals of Electric Drives, CRC Press, 2002.
2. "Vedam Subramanyam", 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 students can be able to

1. Modulate the speed of various DC Motors using single and three phase rectifiers.
2. Demonstrate multi quadrant operation of a DC drive.
3. Describe the Chopper fed DC drive and analyze the performance.
4. Analyze the speed control of Induction Motor by using various methods.
5. Explain the operation, characteristics of closed loop operation of self & separately controlled synchronous Motors By CSI & VSI Cycloconverters.

(A402313) DIGITAL SIGNAL PROCESSING

B. Tech. (EEE) VI-Semester

L	T	P	C
3	0	0	3

Prerequisite

Course Objective:

UNIT - I

Introduction: Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems

Multirate Digital Signal Processing: Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion.

UNIT - II

Discrete Fourier series: Fourier Series, Fourier Transform, Laplace Transform and Z-Transform relation, 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 ZTransform.

Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

UNIT - III

IIR Digital Filters: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

UNIT - IV

FIR Digital Filters: Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

UNIT - V

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.

Finite Word Length Effects: Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round Off Noise, Methods to Prevent Overflow, Trade Off Between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

TEXTBOOKS:

1. V. Oppenheim and R.W. Schaffer - Discrete Time Signal Processing, PHI, 2009
2. John G. Proakis, Dimitris G. Manolakis - Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education / PHI, 2007.

REFERENCE BOOKS:

1. Li Tan - Digital Signal Processing – Fundamentals and Applications, Elsevier, 2008
2. Robert J. Schilling, Sandra L. Harris - Fundamentals of Digital Signal Processing using MATLAB, Thomson, 2007
3. S. Salivahanan, A. Vallavaraj and C. Gnanapriya - Digital Signal Processing, TMH, 2009
4. Emmanuel C. Ifeachor and Barrie W. Jervis - Digital Signal Processing - A Practical approach, 2 nd Edition, Pearson Education, 2009

Course Outcomes

(A402404) NON-CONVENTIONAL ENERGY SOURCES
(Professional Elective-II)

B. Tech. (EEE) VI-Semester

L	T	P	C
3	0	0	3

Prerequisite: None

Course Objectives:

- To describe the various methods of solar energy collection and storage
- To understand the performance of wind energy and bio-mass conversion systems
- To illustrate the concepts of geothermal energy system
- To summarise the need, working principle and limitations of DEC

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 Bioconversion, 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 Direct Energy Conversion(DEC), Carnot cycle, limitations, principles of DEC.

TEXTBOOKS

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 students can 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 conversion systems.

(A402405) ELECTRIC SMART GRID TECHNOLOGIES
(Professional Elective-II)

B. Tech. (EEE) VI-Semester

L	T	P	C
3	0	0	3

Pre-requisites: None
Course Objectives:

- To explain the architecture of smart grid
- To describe the distributed generation technologies
- To analyze the performance of smart grid
- To demonstrate the power control of smart grid system

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: DISTRIBUTED 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.

TEXTBOOKS:
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 students can 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

(A402406) SWITCHED MODE POWER SUPPLY
(Professional Elective-II)

B. Tech. (EEE) VI-Semester

L	T	P	C
3	0	0	3

Pre-requisites: Analog Electronics, Power Electronics

Course Objectives:

1. To design the reactive elements for power electronic systems.
2. To discuss the concepts of switching converters.
3. To explain the operation of resonant converters.
4. To discuss the operation of transformerized switching converters.
5. 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.

TEXTBOOKS

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:

After successful completion of this course, the students can 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.**

(A402511) ELECTRICAL SIMULATION TOOLS LABORATORY-II

B. Tech. (EEE) VI-Semester

L	T	P	C
0	0	3	1.5

Pre-requisite: Power Electronics, Power Systems-II, Control systems, Electrical Machines

Course Objectives:

- To model and simulate controlled rectifiers.
- To simulate various PWM techniques for multilevel inverters
- To analyse Symmetrical and Asymmetrical fault
- To simulate the transfer function of DC motor.

1. Modelling and simulation of single phase full controlled bridge rectifier.
2. Modelling and simulation of single phase semi controlled bridge rectifier.
3. Modelling and simulation of DC-DC chopper.
4. Simulation of PWM techniques.
5. Simulation of Multilevel Inverter.
6. Formulation of Bus admittance and Impedance matrices and solution of networks
7. Power Flow analysis using Gauss Siedal Method.
8. Symmetrical and Asymmetrical fault analysis.
9. Transient stability analysis of SMIB system.
10. Transfer function of DC Motor with open loop (Block diagram approach).
11. Transfer function of DC Motor with closed loop (Block diagram approach with PI controller)
12. Transfer function of DC Motor with closed loop (Block diagram approach with Fuzzy Logic controller).

Note: Any 10 of the above experiments may be conducted using any software tools.

Course Outcomes:

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

- Model controlled rectifiers and choppers.
- Make use of various PWM techniques for multilevel inverters
- Apply Gauss Siedal Method for Power Flow analysis.
- Examine Symmetrical and Asymmetrical fault.
- Apply any simulation for performing the transfer function of DC motor using various approaches.

(A402513) VLSI DESIGN LABORATORY

B. Tech. (EEE) VI-Semester

L	T	P	C
0	0	3	1.5

Note: Any SIX of the following experiments from each part are to be conducted (Total 12)

Part - I
All the following experiments have to be implemented using HDL.

1. **Design of 8-to-3 encoder (without and with priority)**
2. **Design of 8-to-3 decoder**
3. **Design of 8-to-1 multiplexer**
4. **Design of 1-to-8 demultiplexer**
5. **Design of 4-bit binary to Gray code converter**
6. **Design of 4-bit comparator**
7. **Design of Full adder using 3 modelling styles**
8. **Design of flip flops: SR, D, JK, T**
9. **Design of 4-bit binary, BCD counters (synchronous/ asynchronous reset) or any sequence counter**

Part – II
Layout, physical verification, placement & route for complex design, static timing analysis, IR drop analysis and crosstalk analysis for the following:

1. **Basic logic gates**
2. **CMOS inverter**
3. **CMOS NOR/ NAND gates**
4. **CMOS XOR and MUX gates**
5. **Static / Dynamic logic circuit (register cell)**
6. **Latch**
7. **Pass transistor**
8. **Layout of any combinational circuit (complex CMOS logic gate).**

(A400504) ADVANCED ENGLISH COMMUNICATION SKILLS LABORATORY

(Common to all branches)

B. Tech. (EEE) VI-Semester

L	T	P	C
0	0	2	1

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.

2.0

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.

REFERENCES

1. The Basics of Communication: A Relational Prespective, Stev Duck & DavidT. Mc Mahan. Sage South Asia Edition. Sage Publications (2012)
2. English Vocabulary in Use series, Cambridge University Press 2008
3. Barron's – The leader in test preparation 2nd Edition
4. Philip Geer, Barron's – Essential words for the GRE – 3rd Edition
5. PS .Bright-Manual for Group Discussion
6. R Guptas ,Anand Ganguly, Group and Interviews .

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 &amp, nonverbal communication skills.
2. Build academic vocabulary, use a variety of accurate sentence structure and utilize digital literacy tools to develop writing and grammar skills.
3. Express clarity of thoughts, capability to hold the discussion with everyone and develop analytical thinking.
4. Develop the skills needed for approaching different types of interviews Illustrate the report writing and summarize the main ideas of report; apply key elements of structure and style in drafting loner documents.
5. Read an increasing range of different types of texts by combining contextual, semantic, grammatical and phonic knowledge and summarize the personal details, Customize the objectives statement for each position they are applying for job.

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

(A404514) DIGITAL SIGNAL PROCESSING LABORATORY

B. Tech. (EEE) VI-Semester

L	T	P	C
0	0	2	1

The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).

Note: - Minimum of 12 experiments has to be conducted.

List of Experiments:

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations
2. Histogram of White Gaussian Noise and Uniformly Distributed Noise.
3. To find DFT / IDFT of given DT Signal
4. To find Frequency Response of a given System given in Transfer Function/ Differential equation form.
5. Obtain Fourier series coefficients by formula and using FET and compare for half sine wave.
6. Implementation of FFT of given Sequence
7. Determination of Power Spectrum of a given Signal(s).
8. Implementation of LP FIR Filter for a given Sequence/Signal.
9. Implementation of HP IIR Filter for a given Sequence/Signal
10. Generation of Narrow Band Signal through Filtering
11. Generation of DTMF Signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D Sampling Rate Converters
15. Impulse Response of First order and Second Order Systems.

(A400102) BUSINESS ECONOMICS & FINANCIAL ANALYSIS

B. Tech. (EEE) VII-Semester

L	T	P	C
3	0	0	3

Prerequisites:

Course Objective:

Unit – I: Introduction to Business and Economics Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance. Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT - II: Demand and Supply Analysis Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting. Supply Analysis: Determinants of Supply, Supply Function and Law of Supply.

UNIT - III: Production, Cost, Market Structures & Pricing Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT - IV: Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts (Simple Problems).

UNIT - V: Financial Ratios Analysis: Concept of Ratio Analysis, Importance and Types of Ratios, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

TEXTBOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.

2. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.

3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.

REFERENCE BOOKS:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.

2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

Course Outcome:

1. The students will understand the various Forms of Business and the impact of economic variables on the Business.

2. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt.

3. The students can study the firm's financial position by analyzing the Financial Statements of a Company.

(A402407) HIGH VOLTAGE DC TRANSMISSION
(Professional Elective-Iii)

B. Tech. (EEE) VII-Semester

L	T	P	C
3	0	0	3

Prerequisite: Power System-I, Power System-II, Power System Protection, Power System Operation and Control, Power Electronics

Course Objectives:

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

UNIT-I: BASIC CONCEPTS:
Necessity of HVDC systems, Economics and Terminal equipment of HVDC transmission systems, Types of HVDC Links, Apparatus required for HVDC Systems, Comparison of AC and DC Transmission, Application of DC Transmission System, Planning and Modern trends in D.C Transmission.
ANALYSIS OF HVDC CONVERTERS: Choice of Converter Configuration, Analysis of Graetz circuit, Characteristics of 6 Pulse and 12 Pulse converters, Cases of two 3 phase converters in Y/Y mode– their performance.

UNIT-II: CONVERTER AND HVDC SYSTEM CONTROL
Principle of DC Link Control, Converters Control Characteristics, firing angle control, Current and Extinction angle control, Effect of source inductance on the system, Starting and stopping of DC link, Power Control.
REACTIVE POWER CONTROL IN HVDC: Introduction, Reactive Power Requirements in steady state, sources of reactive power- Static VAR Compensators, Reactive power control during transients.

UNIT-III: POWER FLOW ANALYSIS IN AC/DC SYSTEMS
Modelling of DC Links, DC Network, DC Converter, Controller Equations, Solution of DC load flow, P.U. System for DC quantities, solution of AC-DC Power flow-Simultaneous Method-Sequential method.

UNIT-IV: CONVERTER FAULTS AND PROTECTION
Converter faults, protection against over current and over voltage in converter station, surge arresters, smoothing reactors, DC breakers, Audible noise, space charge field, corona effects on DC lines, Radio interference.

UNIT-V: HARMONICS
Generation of Harmonics, Characteristics harmonics, calculation of AC Harmonics, Non- Characteristic harmonics, adverse effects of harmonics, Calculation of voltage and Current harmonics, Effect of Pulse number on harmonics
FILTERS: Types of AC filters, Design of Single tuned filters –Design of High pass filters.

TEXTBOOKS:

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 & energy series 29, 2nd edition 1998.
3. E. W. Kimbark, Direct Current Transmission, John Wiley and Sons, volume 1, 1971.
4. E. Uhlmann, Power Transmission by Direct Current, B. S. Publications, 2009

Course Outcomes:

After successful completion of this course, the students can be able to
1. Compare EHV AC and HVDC system and to describe various types of DC links.
2. Analyse various converter Control Characteristics in HVDC systems.
3. Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems.
4. Describe various protection methods for HVDC systems.
5. Classify harmonics and design different types of filters.

(A402408) Energy Storage Systems and Control
(Professional Elective-III)

B. Tech. (EEE) VII-Semester

L	T	P	C
3	0	0	3

Prerequisites: Basics of Electrical Engineering (or equivalent subject)

Unit-I: ENERGY STORAGE SYSTEM:
Batteries: Lead Acid Battery, Nickel based batteries, Sodium based batteries, Lithium based batteries – Li-ion & Li-poly, Metal Air Battery, Zine Chloride battery; Ultra capacitors; Flywheel Energy Storage System; Hydraulic Energy Storage System; Comparison of different Energy Storage System Suggested reading: Study of different types of batteries

Unit-II: BATTERY CHARACTERISTICS & PARAMETERS:
Cells and Batteries - Conversion of chemical energy to electrical energy- Battery Specifications: Variables to characterize battery operating conditions and Specifications to characterize battery nominal and maximum characteristics; Efficiency of batteries; Electrical parameters Heat generation- Battery design Performance criteria for Electric vehicles batteries- Vehicle propulsion factors- Power and energy requirements of batteries- Meeting battery performance criteria- setting new targets for battery performance.

Unit-III: BATTERY MODELLING:
General approach to modelling batteries, simulation model of a rechargeable Li-ion battery, simulation model of a rechargeable NiCd battery, Parameterization of the NiCd battery model, Simulation examples.

Unit-IV: BATTERY PACK AND BATTERY MANAGEMENT SYSTEM:
Selection of battery for EVs & HEVs, Traction Battery Pack design, Requirement of Battery Monitoring, Battery State of Charge Estimation methods, Battery Cell equalization problem, thermal control, protection interface, SOC Estimation, Energy & Power estimation, Battery thermal management system, Battery Management System: Definition, Parts: Power Module, Battery, DC/DC Converter, load, communication channel, Battery Pack Safety, Battery Standards & Tests.

Unit-V: BATTERY TESTING, DISPOSAL & RECYCLING:
Chemical & structure material properties for cell safety and battery design, battery testing, limitations for transport and storage of cells and batteries, Recycling, disposal and second use of batteries. Battery Leakage: gas generation in batteries, leakage path, leakage rates. Ruptures: Mechanical stress and pressure tolerance of cells, safety vents, Explosions: Causes of battery explosions, explosive process, Thermal Runway: High discharge rates, Short circuits, charging and discharging. Environment and Human Health impact assessments of batteries, General recycling issues and drivers, methods of recycling of EV batteries.

Reference Books:

1. Guangjin Zhao, “Reuse and Recycling of Lithium-Ion Power Batteries”, John Wiley & Sons. 2017. (ISBN: 978-1-1193-2185-9)
2. Arno Kwade, Jan Diekmann, “Recycling of Lithium-Ion Batteries: The LithoRec Way”, Springer, 2018. (ISBN: 978-3-319-70571-2)
3. Ibrahim Dinçer, Halil S. Hamut and Nader Javani, “Thermal Management of Electric Vehicle Battery Systems”, JohnWiley& Sons Ltd., 2016.
4. Chris Mi, Abul Masrur& David Wenzhong Gao, “Hybrid electric Vehicle- Principles & Applications with Practical Properties”, Wiley, 2011.
5. G. Pistoia, J.P. Wiaux, S.P. Wolsky, “Used Battery Collection and Recycling”, Elsevier, 2001. (ISBN: 0-444-50562-8)”
6. T R Crompton, “Battery Reference Book-3 rd Edition”, Newnes- Reed Educational and Professional Publishing Ltd., 2000.
7. James Larminie, John Lowry, “Electric Vehicle Technology Explained”, John Wiley & Sons Ltd, 2003.
8. G. Pistoia, J.P. Wiaux, S.P. Wolsky, “Used Battery Collection and Recycling”, Elsevier, 2001. (ISBN: 0-444-50562-8)”

(A402409) HIGH VOLTAGE ENGINEERING
(Professional Elective-III)

B. Tech. (EEE) VII-Semester

L	T	P	C
3	0	0	3

Prerequisite: Power Systems – I, Electro Magnetic Fields
Course Objectives:

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

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

BREAKDOWN IN LIQUID AND SOLID INSULATING MATERIALS
Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic
Breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.

UNIT-II: GENERATION OF HIGH VOLTAGES
Generation of high voltages, generation of high D. C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT-III: MEASUREMENTS OF HIGH VOLTAGES AND CURRENTS
Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements.

UNIT-IV: LIGHTNING AND SWITCHING OVER-VOLTAGES
Charge formation in clouds, Stepped leader, Dart leader, Lightning Surges. Switching overvoltage, Protection against over-voltages, Surge diverters, Surge modifiers.

UNIT-V: HIGH VOLTAGE TESTING OF ELECTRICAL APPARATUS AND HIGH VOLTAGE LABORATORIES
Various standards for HV Testing of electrical apparatus, IS, IEC standards, Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformers and some high voltage equipment, High voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H. V. Labs.

TEXTBOOKS:

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

REFERENCES:

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

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

1. Realize the importance of high voltage technology and its applications.
2. Comprehend the breaking phenomena and dielectric strength of different media (solids, gaseous, liquids).
3. Design analysis for the measurement of high voltages and currents.
4. Elucidate different causes of over voltage and insulation coordination for over voltages.
5. Distinguish different types of testing methodologies of various high voltage apparatus.

(A402410) SPECIAL ELECTRICAL MACHINES
(Professional Elective-IV)

B. Tech. (EEE) VII-Semester

L	T	P	C
3	0	0	3

Prerequisite: Electrical Machines-I, Electrical Machines-II
Course Objectives:

- To understand the working of PMBLDC and PMSM motors
- To describe the construction, working and characteristics of switched reluctance motors
- To analyse the linear and non-linear characteristics of stepper motors
- To compare the characteristics of various special machines

UNIT I PERMANENT MAGNET BRUSHLESS DC MOTORS
Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations- Characteristics and control

UNIT II PERMANENT MAGNET SYNCHROUNOUS MOTORS
Principle of operation – EMF and Torque equations - Phasor diagram - Power controllers – Torque speed characteristics – Digital controllers – Constructional features, operating principle and characteristics of synchronous reluctance motor
.

UNIT III SWITCHED RELUCTANCE MOTORS
Constructional features –Principle of operation- Torque prediction–Characteristics Power controllers – Control of SRM drive- Sensor less operation of SRM – Applications.

UNIT IV STEPPER MOTORS
Constructional features –Principle of operation –Types – Torque predictions – Linear and Non-linear analysis – Characteristics – Drive circuits – Closed loop control –Applications.

UNIT V OTHER SPECIAL MACHINES
Principle of operation and characteristics of Hysteresis motor – AC series motors – Linear motor – Applications.

REFERENCES:
1. T.J.E. Miller, 'Brushless magnet and Reluctance motor drives', Claredon press, London, 1989.
2. R.Krishnan, ' Switched Reluctance motor drives' , CRC press, 2001.
3. T.Kenjo, ' Stepping motors and their microprocessor controls', Oxford University press, New Delhi, 2000.

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

1. Explain the working of PMBLDC.
2. Describe the constructional features, working and characteristics of PMSM motors.
3. Illustrate the construction, working and characteristics of switched reluctance motors.
4. Compare the linear and non-linear characteristics of stepper motors.
5. Distinguish the characteristics of various special machines.

(A402411) FLEXIBLE AC TRANSMISSION SYSTEMS
(Professional Elective-IV)

B. Tech. (EEE) VII-Semester

L	T	P	C
3	0	0	3

Prerequisite: Power Electronics, Power Systems-I, Power Systems-II
Course Objective:

- To understand the basic FACTS concepts
- To describe the 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 converters, 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 compensatory 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.

TEXTBOOKS

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 Controllers for Electrical Transmission Systems, R.Mohan Mathur, Rajiv K. Varma.Wiley India.
2. FACTS Modelling and Simulation in Power Networks, Enrique Acha, Wiley India Distributed by BSP Books Pvt. Ltd.

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

1. Comprehend the importance of controllable parameters and benefits of FACTS controllers.
2. Analyse 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.

(A402412) ELECTRICAL & HYBRID VEHICLES
(Professional Elective-IV)

B. Tech. (EEE) VII-Semester

L	T	P	C
3	0	0	3

Prerequisite: Power Semiconductor Drives, Electrical Drives and Control, Utilization of Electric Energy

Course Objectives:
- To understand the fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
- To know the various aspects of hybrid and electric drive train such as their configuration, types of electric machines that can be used energy storage devices, etc.

UNIT - I Introduction to Conventional Vehicles:
Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

UNIT - II Introduction To Hybrid Electric Vehicles:
History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.
Hybrid Electric Drive-Trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT - III Electric Trains:
Electric Drive trains: Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.
Electric Propulsion Unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT - IV Energy Storage:
Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems

UNIT - V Energy Management Strategies:
Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.
Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

TEXTBOOKS:
1. C. Mi, M. A. Masrur and D. W. Gao, “Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives”, John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, “Hybrid Electric Vehicles: Energy Management Strategies”, Springer, 2015.

REFERENCE BOOKS:
1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design”, CRC Press, 2004.
2. T. Denton, “Electric and Hybrid Vehicles”, Routledge, 2016.

Course Outcomes:

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

1. Explain the performance of conventional vehicles.
2. Understand the models to describe hybrid vehicles and their performance.
3. Describe the various electric drive train topologies.
4. Illustrate the different possible ways of energy storage.
5. Analyse the different strategies related to energy management systems.

(A402413) POWER QUALITY
(Professional Elective-V)

B. Tech. (EEE) VII-Semester

L	T	P	C
3	0	0	3

Prerequisite: Power Electronics, Power System Operation and Control

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:

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

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

(A402414) ELECTRICAL ENERGY CONSERVATION & AUDITING
(Professional Elective-V)

B. Tech. (EEE) VII-Semester

L	T	P	C
3	0	0	3

Prerequisite: Power System-1
Course Objective:

- To explain the energy scenario
- To demonstrate the efficiency improving methodologies to conserve energy.
- To illustrate 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 ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

Text/Reference Books:

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

Course Outcomes:
After successful completion of this course, the students can be able 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 electrical systems.
5. Explain the concepts of different energy efficient technologies.

(A402415) POWER ELECTRONIC APPLICATIONS TO RENEWABLE ENERGY SYSTEMS

(Professional Elective-V)

B. Tech. (EEE) VII-Semester

L	T	P	C
3	0	0	3

Prerequisite: Power Electronics, Renewable Energy Sources

Course Objectives:

- To understand the various non-conventional sources of energy
- To explain the DC-to-DC converters for Solar PV source of energy
- To explain the inverters and their control techniques for a grid connected system.
- To understand the characteristics of wind power sources
- To explain the types of distributed generators and batteries in DG and micro grid system

UNIT – I:

Introduction to renewable sources: world energy scenario, Wind, solar, hydro, geothermal, availability and power extraction. Introduction to solar energy: Photovoltaic effect, basics of power generation, P-V &I-V characteristics, effect of insolation, temperature, diurnal variation, shading, Modules, connections, ratings, Power extraction (MPP) tracking and MPPT schemes.

UNIT – II:

Centralized Inverters, String Inverters, Multi-string Inverters, Module Integrated Inverter/Micro-inverters, Inverter Topology, Model of Inverter, Sizing Batteries and Inverters for a Solar PV System. Types of PV Systems: Grid-Connected Solar PV System, Stand-Alone Solar PV System.

UNIT – III:

Introduction to wind: Characteristics, Wind Turbine, Fixed and Variable-Speed Wind Turbines, Components of WECS, Description of Components, Types of Wind Turbine Generators, Economics of Wind Energy Conversion Systems, Linking Wind Turbines onto the Grid, Power Converter Topologies for Wind Turbine Generators.

UNIT – IV:

Modelling of Permanent Magnet Synchronous Generators, Doubly Fed Induction Generators, Squirrel cage Induction Generators wind turbine, Control of Power converters for WECS.

UNIT – V:

Hybrid Energy Systems, Need for Hybrid Energy Systems, Range and types of Hybrid systems, Hybrid Solar PV/Wind Energy System, Architecture of Solar-Wind Hybrid System and Grid connected issues.

TEXT BOOKS:

1. Sudipta Chakraborty, Marcelo G. Simes, and William E. Kramer. Power Electronics for Renewable and Distributed Energy Systems: A Sourcebook of Topologies, Control and Integration. Springer Science & Business, 2013.
2. Nicola Femia, Giovanni Petrone, Giovanni Spagnuolo, Massimo Vitelli, Power Electronics and control for maximum Energy Harvesting in Photovoltaic Systems, CRC Press, 2013.
3. S. N. Bhadra, D. Kastha, S. Banerjee, "Wind Electrical Systems", Oxford University Press, 2005.
4. S. N. Bhadra, D. Kastha, & S. Banerjee "Wind Electrical Systems", Oxford University Press, 2009.

REFERENCE BOOKS:

1. N. Mohan, T.M. Undeland& W. P. Robbins, Power Electronics: Converter, Applications & Design, John Wiley & Sons, 1989
2. Muhammad H. Rashid, Power Electronics: Circuits, Devices, and Applications, Pearson Education India, 2004
3. E. Guba, P. Sanchis, A. Ursa, J. Lpez, and L. Marroyo, Ground currents in single-phase transformer less photovoltaic systems, Progress in Photovoltaics: Research and Applications, vol. 15, no. 7, 2007.
4. Remus Teodorescu, Marco Liserre, Pedro Rodriguez, Grid Converters for Photovoltaic and Wind Power Systems, John Wiley and Sons, Ltd., 2011.
5. Ali Keyhani, Design of Smart Power Grid Renewable Energy Systems, Wiley-IEEE Press, 2011.
6. Chetan Singh Solanki, Solar Photovoltaics: fundamentals, Technologies and Applications, Prentice Hall of India, 2011.
7. Rashid. M. H, "Power Electronics Handbook", Academic Press, 2001.

Course Outcomes:

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

- Analyze various non-conventional sources of energy
- Describe the converters for Solar PV source of energy.
- Summarize the inverters and its control techniques for a grid connected system.
- Illustrate the characteristics of wind power sources.
- Compare the types of distributed generators and batteries in DG and micro grid system.

(A402311) POWER SYSTEM OPERATION AND CONTROL

B. Tech. (EEE) VII-Semester

L	T	P	C
2	0	0	2

Pre-requisites: Power System-I, Power System-II

Course Objectives:

- To understand the economic operation of Power Systems, Hydrothermal scheduling and modelling of turbines, generators and automatic controllers.
- To demonstrate the single area and two area load frequency control and reactive power control.
- To summarize the computer control of power systems

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 Commitment: Statement of unit commitment (UC) problem - constraints on UC problem - solution of UC problem using priority list – special aspects of short term and long term hydrothermal problems.

UNIT -III: REAL POWER FREQUENCY CONTROL

Fundamentals of Speed Governing System and Modelling, Modelling of Turbine, Modelling of Generator, 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 –IV REACTIVE POWER –VOLTAGE CONTROL

Generation and absorption of reactive power -Modelling of Excitation System ,static and dynamic analysis

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)

UNIT V COMPUTER CONTROL OF POWER SYSTEMS

Need of computer control of power systems-concept of energy control centres and functions– PMU - system monitoring, data acquisition and controls - System hardware configurations- SCADA and EMS functions - state estimation problem – measurements and errors -weighted least square estimation - various operating states - state transition diagram.

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 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 Grawhill Publishing Company Ltd., Second edition.
2. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
3. Power System Analysis by HadiSaadat- TMH Edition.

Course Outcomes:

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

1. Explain the optimal operation of power systems.
2. Examine the hydrothermal scheduling.
3. Describe single area and two area load frequency controls.
4. Interpret reactive power control and compensation.
5. Summarize the computer control of power systems

(A402416) ELECTRICAL DISTRIBUTION SYSTEMS
(Professional Elective-VI)

B. Tech. (EEE) VIII-Semester

L	T	P	C
3	0	0	3

Prerequisites: Power System -I, Power System -II

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 Distribution system planning, Load modelling and characteristics. Coincidence factor - contribution factor – Loss factor - Relationship between the load factor and loss factor. Load growth, Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

DISTRIBUTION FEEDERS:

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

UNIT-II:

SUBSTATIONS

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

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

UNIT-III:

PROTECTION

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

UNIT-IV:

COMPENSATION FOR POWER FACTOR IMPROVEMENT

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

UNIT V: VOLTAGE CONTROL

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

Course Outcomes:

After successful completion of this course, the students can 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.

(A402417) AI TECHNIQUES IN ELECTRICAL ENGINEERING
(Professional Elective-VI)

B. Tech. (EEE) VIII-Semester

L	T	P	C
3	0	0	3

Pre-requisites: Power Systems Operation and Control

Course Objectives:

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

TEXTBOOKS

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, 1989.
2. Bart Kosko; Neural Network & Fuzzy System, Prentice Hall, 1992
3. D.E.Goldberg, Genetic Algorithms, Addison-Wesley 1999.

Course Outcomes:

After successful completion of this course, the students can 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.

(A402418) POWER SYSTEM RELIABILITY
(Professional Elective-VI)

B. Tech. (EEE) VIII-Semester

L	T	P	C
3	0	0	3

Prerequisite: Reliability Engineering, Power System-I, Power System-II, Power System Operation and Control
Course Objectives:

- To describe the generation system model and recursive relation for capacitive model building
- To explain the equivalent transitional rates, cumulative probability and cumulative frequency
- To develop the understanding of risk, system and load point reliability indices
- To explain the basic and performance reliability indices

UNIT- I Basic Probability Theory:
Elements of probability, probability distributions, Random variables, Density and Distribution functions- Binomial distribution- Expected value and standard deviation - Binomial distribution, Poisson distribution, normal distribution, exponential distribution, Weibull distribution. Definition of Reliability: Definition of terms used in reliability, Component reliability, Hazard rate, derivation of the reliability function in terms of the hazard rate. Hazard models - Bath tub curve, Effect of preventive maintenance. Measures of reliability: Mean Time to Failure and Mean Time between Failures.

UNIT - II Generating System Reliability
Analysis: Generation system model – capacity outage probability tables – Recursive relation for capacitive model building – sequential addition method – unit removal – Evaluation of loss of load and energy indices – Examples. Frequency and Duration methods – Evaluation of equivalent transitional rates of identical and non-identical units – Evaluation of cumulative probability and cumulative frequency of non-identical generating units – 2-level daily load representation - merging generation and load models – Examples.

UNIT- III Operating Reserve Evaluation:
Basic concepts - risk indices – PJM methods – security function approach – rapid start and hot reserve units – Modeling using STPM approach.
Bulk Power System Reliability Evaluation: Basic configuration – conditional probability approach – system and load point reliability indices – weather effects on transmission lines – Weighted average rate and Markov model – Common mode failures.
Interconnected System Reliability Analysis: Probability array method – Two interconnected systems with independent loads – effects of limited and unlimited tie capacity - imperfect tie – Two connected Systems with correlated loads – Expression for cumulative probability and cumulative frequency.

UNIT- IV Distribution System Reliability Analysis:
Basic Techniques – Radial networks –Evaluation of Basic reliability indices, performance indices – load point and system reliability indices – customer oriented, loss and energy-oriented indices – Examples. Basic concepts of parallel distribution system reliability

UNIT- V Substations and Switching Stations:
Effects of short-circuits - breaker operation – Open and Short circuit failures – Active and Passive failures – switching after faults – circuit breaker model – preventive maintenance – exponential maintenance times.

TEXTBOOKS:
1. Reliability Evaluation of Power systems by R. Billinton, R.N. Allan, BS Publications, 2007.
2. Reliability Modeling in Electric Power Systems by J. Endrenyi, John Wiley and Sons, 1978

REFERENCE BOOKS:
1. Reliability Engineering: Theory and Practice by Alessandro Birolini, Springer Publications.
2. An Introduction to Reliability and Maintainability Engineering by Charles Ebeling, TMH Publications. 3. Reliability Engineering by E. Balaguruswamy, TMH Publications.
4. Reliability Engineering by Elsayed A. Elsayed, Prentice Hall Publications.

Course Outcomes:

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

1. Illustrate various probability theory.
2. Estimate loss of load and energy indices for generation systems model
3. Analyse interconnected system reliability.
4. Apply various indices for distribution systems.
5. Explain the preventive maintenance to be undergone for substations.

(A404601) FUNDAMENTALS OF INTERNET OF THINGS
(Open Elective-I Offered by ECE)

B. Tech. (EEE)

L	T	P	C
3	0	0	3

Prerequisite: None

UNIT – I
Introduction to Arduino: Introduction to Arduino Uno, Features, Pin functionality, Basic Arduino Programming: Interfacing LEDs, Switches using Digital I/O Read/Write, Acquiring and generating signals using Analog I/O Read/Write, Serial functions.

UNIT – II
Introduction to Raspberry Pi: Introduction to Raspberry Pi, Pin functionality, Revision of Python Programming; Raspberry Pi commands, GPIO programming.
Other Open-Source Devices: Features and pin functions of Node MCU, ESP8266, ESP32.

UNIT - III
Introduction to IOT: Terms and definitions, Logical design of IoT, IOT Reference Model.
IOT and M2M: Introduction to M2M, Difference between IoT and M2M and other types.
IOT Servers and Cloud Offerings: IoT enabling technologies – Cloud Computing; Introduction to Cloud Storage/Services – Google, Microsoft Azure, IBM, Amazon Web services for IOT, setting up to read and write using Thing speak;

UNIT – IV
IOT & Communication Protocols: Serial –RS 485, IEEE1394 Firewire, I2C, SPI, USB,CAN; Wireless sensor networks and its technologies, IOT Protocols.

UNIT – V
Domain Specific IOT Applications & Case Studies:
IOT Application & case studies for Agriculture, Smart Cities & Transport, Home Automation, Environment, Retail, Logistics, Health, Lifestyle, Industry – Energy;

TEXTBOOKS:
1. Srinivasa K G, Siddesh G M, Hanumantha Raju R, Internet of Things, Cengage, 2019.

REFERENCE BOOKS:
1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-on-Approach", VPT, 1st Edition, 2014
2. Jeremy Blum, Exploring Arduino: Tools and Techniques for Engineering Wizardry, Wiley, 2013.
3. Simon Monk, Raspberry Pi Cookbook, O'Reilly 3rd Edition, 2019
4. Michael Margolis, Arduino Cookbook, 2nd Edition, December 2011, O'Reilly Media, Inc.
5. Rahul Dubey, An Introduction to Internet of Things – Connecting Devices, Edge Gateway, and Cloud with Applications, Cengage, 2019.

Course Outcomes: By the end of the course students will be able to
1. Have knowledge of programming open-source Edge devices like Arduino, Raspberry Pi.
2. Apply the knowledge of Arduino and raspberry pi with clouds for IOT applications.
3. Analyze the different communication and IOT protocols.
4. Aware of various cloud services and providers.
5. Understand various IOT implementations in different domains.

CO- PO MAPPING :

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

(A404602) PRINCIPLES OF DIGITAL SIGNAL PROCESSING
(Open Elective-I Offered by ECE)

L	T	P	C
3	0	0	3

B.Tech(EEE)

Prerequisite: None

UNIT-I

Introduction to Signal and Systems

Basic Signals and Systems – properties and basic operations-1-D Signals and Filters – Random Signals - Multi-dimensional Signals – Analog and Digital signals and their conversion techniques Convolution process, Filtering process, Z-transform concepts.

UNIT-II

Time domain analysis and Characteristics

Correlation and Discrete sequences: notation, signal characteristics, and operations Discrete linear time invariant systems -Properties and analysis of discrete linear time invariant systems Periodic sampling: aliasing and lowpass filtering.

UNIT-III

Frequency domain Analysis

Discrete Fourier transforms (DFT) DFT properties: symmetry, linearity, magnitudes, frequency axis, and shifting Inverse DFT-Fast Fourier transform (FFT): relationship to DFT, implementation considerations, radix-2 algorithm, and input/output indexing FFT: butterfly algorithm structures.

UNIT-IV

FIR filter design

FIR filters–Introduction-Basic Properties-Design using Hamming, Hanning Windows-Realization of FIR filters.

UNIT-V

IIR filter design

Review of design of analogue Butterworth Filters, - Design of IIR digital filters using impulse invariance technique-Realization using direct, cascade and parallel forms.

TEXTBOOKS:

1. Richard G. Lyons, Understanding Digital Signal Processing, Third edition, Prentice-Hall, 2011.
2. Introduction to Digital Signal Processing, J.Proakis &E.Manolakis, MacMillan, 2007 (4thEdition)

References:

1. 1.S.Salivahanan, A.Vallavaraj,C.Gnanapriya,Digital Signal Processing, TMH/Mc Graw Hill International, 2007
2. E.C.I feachor and B.W.Jervis,"Digital signal processing-A practical approach",Second edition,Pearson,2002.

Course Outcomes:
Students will be able to

1. Characterize discrete time signals and LTI signal processing systems mathematically.
2. Analyze the functions performed by simple discrete-time systems.
3. Develop the discrete Fourier transform (DFT) over time domain signals, its applications, and itsimplementation by FFT techniques.
4. Apply the design techniques for FIR type digital filters known as the ―windowing method.
5. Design IIR type digital filters over the given specifications

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										1

CO2	**3**	**3**										**1**
CO3	**3**	**3**	**2**									**1**
CO4	**3**	**3**	**2**	**2**								**1**
CO5	**3**	**3**	**2**	**2**								**1**

(A402601) RENEWABLE ENERGY SOURCES
(Open Elective-I offered by EEE)

L	T	P	C
3	0	0	3

B. Tech. (EEE)
Prerequisite: None

UNIT I: GLOBAL AND NATIONAL ENERGY SCENARIO
Overview of conventional & renewable energy sources, need & development of renewable energy sources, typesof renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Non-renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO2 reduction potential of renewable energy- concept of Hybrid systems.

UNIT II: SOLAR ENERGY
Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applicationsof solar energy systems.

UNIT III: WIND ENERGY
Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, winddata and energy estimation, wind speed monitoring, classification of wind, characteristics, applications of wind turbines, offshore wind energy – Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices. Windmill component design, economics and demand side management, energy wheeling, and energy banking concepts. Safety and environmental aspects, wind energy potential and installationin India.

UNIT IV: 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, Thermochemical 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.

UNIT V: OCEAN ENERGY
Ocean wave energy conversion, principle of Ocean Thermal Energy Conversion (OTEC), ocean thermal power plants, tidal energy conversion, Tidal and wave energy its scope and development, Scheme of development of tidal energy.
Small hydro Power Plant: Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation of primary and secondary power.
Geothermal Energy: Geothermal power plants, various types, hot springs and steam ejection.

TEXTBOOKS
1. Renewable Energy Sources / Twidell, J.W. and Weir, A./ EFN Spon Ltd., 1986.
2. Non-Conventional Energy Sources / G.D Rai/ Khanna Publishers

Course Outcomes:
After successful completion of this course, the students can be able to:
1. Understand the importance of renewable energy sources.
2. Explain the operation of solar energy system.
3. Illustrate various wind energy conversion systems.
4. Explain the operation Bio gas conversion
5. Explain the principle and operation of Ocean wave energy conversion.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1			1			2		
CO2	2	1	1	1			1			2		
CO3	2	1	1	1			1			2		

CO4	2	1	1	1			1			2		
CO5	2	1	1	1			1			2		

(A402602) BASICS OF POWER ELECTRONICS & DRIVES
(Open Elective-1 Offered by EEE)

L	T	P	C
3	0	0	3

B.Tech(EEE)

Prerequisite: None

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;

TEXTBOOKS:
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”, JohnWilley & 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.

CO- PO MAPPING:

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

(A405604) JAVA PROGRAMMING

(Open Elective-I Offered by CSE)

B. Tech (EEE)

L	T	P	C
3	0	0	3

Prerequisite: None

UNIT–I

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, String Buffer 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 orImplementing the Runnable Interface, Thread Lifecycle, Thread Priority, Synchronization.

UNIT–V

java.io Package, File Class, File Input Stream Class, File Output Stream Class, Scanner Class, Buffered Input Stream Class, Buffered Output Stream Class, Random-access Class.

TEXTBOOKS:

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

CO- PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2		2							1
CO2	1	2	2		2							1
CO3	1	2	2	2	2							2
CO4	1	2	2	2	2					2		2
CO5	1	2	2	2	2					2		2

(A405602) FUNDAMENTALS OF OPERATING SYSTEMS
(Open Electeive-I Offered by CSE)

L	T	P	C
3	0	0	3

B. Tech (EEE)
Prerequisite: None

UNIT - I
Operating System - Introduction, Structures - Simple Batch, Multiprogrammed, Time-shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls Process - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads

UNIT - II
CPU Scheduling - Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling. System callinterface for process management-fork, exit, wait, waitpid, exec
Deadlocks - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock

UNIT - III
Process Management and Synchronization - The Critical Section Problem, Synchronization Hardware, Semaphores,and Classical Problems of Synchronization, Critical Regions, Monitors

UNIT – IV
Interprocess Communication Mechanisms: IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

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

TEXTBOOKS:
1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.
2. Advanced programming in the UNIX environment, W.R. Stevens, Pearson education.

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

Course Outcomes:

1. Demonstrate the knowledge of the components of computers and their respective roles in computing.
2. Explain CPU Scheduling Algorithms and Explain the methods for handling Deadlocks.
3. Explain Process Management and Synchronization and Demonstrate Inter process Communication.
4. Analyze various Memory Management and Allocation Methods.
5. Discuss File System Interface and Operations

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1											
CO2	1	2	2	2								
CO3	1	2	2	2								
CO4	1	2	2	2								
CO5	1	2	2	2								

(A403601) FUNDAMENTALS OF ENGINEERING MATERIALS
(Open Elective-I Offered by Mechanical)

L	T	P	C
3	0	0	3

B.Tech(EEE)
Prerequisite: None

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.

TEXTBOOKS:
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.

CO- PO MAPPING :

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

(A403602) BASICS OF THERMODYNAMICS

(Open Elective-I Offered by Mechanical)

L	T	P	C
3	0	0	3

B.Tech(EEE)

Prerequisite: None

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 ofIrreversibility.

UNIT - II

Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale.

UNIT – III

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

UNIT - IV

Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Specific Humidity, Relative Humidity, saturated Air, Vapor 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, Vapor compression cycle-performance Evaluation.

TEXTBOOKS:

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.

CO-PO MAPPING

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

(A400601) BASICS OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

(Open Elective-I Offered by MBA)

L	T	P	C
3	0	0	3

B.Tech(EEE)
Prerequisite: None

Unit – I: Understanding Supply Chain: Objectives of a Supply Chain, Importance, Stages of Supply Chain, Value Chain Process, Cycle View of Supply Chain Process, Key Issues in SCM, Logistics & SCM, Supply Chain Drivers and Obstacles, Supply Chain Strategies, Strategic Fit, Best Practices in SCM, Obstacles of Streamlined SCM, Green Supply Chain Management, Supply Chain Sustainability.

Unit – II: Logistics: Evolution, Objectives, Components and Functions of Logistics Management, Difference between Logistics and Supply Chain, Distribution related Issues and Challenges. Gaining Competitive Advantage through Logistics Management, Transportation: Functions, Costs, and Mode of Transportation Network and Decision, Models, Containerization,Cross Docking, Reverse Logistics. Outsourcing: Nature and Concept, Strategic Decision to Outsourcing, Third-party Logistics (3PL), Fourth-party Logistics (4PL).

Unit – III: Designing the Supply Chain Network: Designing the Distribution Network, Role ofDistribution, Factors Influencing Distribution, Design Options, e-Business and its Impact, Distribution Networks in Practice, Network Design in the Supply Chain, Role of Network, Factors Affecting the Network Design Decisions, Modeling for Supply Chain.

Unit – IV: SupplyChain Performance: Bullwhip Effect and Reduction, Performance Measurement: Dimension, Tools of Performance Measurement, SCOR Model. Demand Chain Management, Global SupplyChain, Challenges in Establishing Global Supply Chain, Factors that influence Designing GlobalSupply Chain Network.

Unit – V: Coordination in a Supply Chain: Importance of Coordination, Lack of Supply ChainCoordination and the Bullwhip Effect, Obstacles to Coordination, Managerial Levels, Building Partnerships and Trust, Continuous Replenishment and Vendor Managed Inventories, Collaborative Planning, Forecasting and Replenishment. Role of Information Technology in Supply Chain, Supply Chain 4.0..

TEXTBOOKS

1. IMT Ghaziabad, Advanced Supply Chain Management, Sage Publications, 2021.
2. Rajat K. Basiya, Integrated Supply Chain Management, Sage Publications, 2020.

REFERENCE BOOKS

1. K Sridhara Bhat, Logistics & Supply Chain Management, HPH,1e,2017.
2. Chopra, Sunil, Meindl, Peter and Kalra, D. V., Supply Chain Management: Strategy, Planning and Operation; Pearson Education, 6e, 2016.
3. Donald J. Bowersox and David J. Closs, Logistical Management" The Integrated Supply Chain Process, TMH, 2017
4. Sunil Chopra and Peter Meindl, Supply chain Management: Strategy, Planning andOperation, Pearson Education, New Delhi 2013

Course Outcomes: Students will be able to:

1. Understand the cyclical perspective of logistics and supply chain process.
2. Learn about the distribution, transportation, warehousing related issues and challenges insupply chain.
3. Appreciate the significance of network design in the supply chain.
4. Gain knowledge of various models / tools of measuring the Supply Chain Performance.
5. Appreciate the role of coordination and technology in supply chain management.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	2	2	2	2	-	-	-
CO2	3	2	3	-	-	2	2	-	-	3	-	2

CO3	-	3	3	2	3	3	2	-	3	-	-	-
CO4	-	-	-	2	3	3	-	-	-	-	3	-
CO5	-	-	-	-	3	-	2	2	3	-	3	2

(A400602) INDUSTRIAL RELATIONS

(Open Elective-I Offered by MBA)

L	T	P	C
3	0	0	3

B.Tech(EEE)
Prerequisite: None

UNIT-I

Overview of Industrial Relations: Meaning & Objectives, Scope, Importance, Approaches to Industrial Relations – Role of Three Actors to Industrial Relations – State, Employer & Employees, Causes for poor IR, Developing sound IR. Ethical approach to IR: Idea of trusteeship

– Principles & features, Code of conduct. The industrial policy resolution 1991.ILO in IR. Collective Bargaining (Perspective, Bargaining Structure, Procedure and Machinery for Collective Bargaining) – The Bargaining Process – Strengths and Skills

UNIT-II

Laws on Industrial Relations: The Trade Union Act 1926: Role & function of Trade union,Registration, Rights and privileges, Duties, Dissolution of Trade Unions.

Industrial Disputes Act 1947: Strike, Lockout, Layoff, Retrenchment, Grievance and disciplinary procedures, Penalties, Causes, Tripartite & Bipartite Bodies, Grievance Procedure.

Industrial Employment Act, 1946: Information in standing orders, Procedure for submission

UNIT-III

Laws on Wages, Welfare and Social Security: Minimum Wages Act, 1948, Payment of WagesAct, 1936, Payment of Bonus Act, 1965 Laws on Labour Welfare: The Workmen's CompensationAct, 1923, The Employees' State Insurance Act,1948, The Maternity Benefit Act, 1961.Laws onSocial Security: The Employee's Provident Fund Act, 1952, The Payment of Gratuity Act, 1972.

UNIT-IV

Laws on Working Conditions: Factories Act, 1948: Health, Welfare, Safety, Working Hours, Annual Leave with wages, Registers and Records. Contract Labour (Regulation and Abolition) Act, 1986 – Child Labour (Prohibition and Regulation Act, 1986)

UNIT-V

Quality of Work Life and Quality Circles: Meaning of quality of work life – Quality Circles- Objectives- Process, Structure and problems- workers participation in management and quality circles – Concept of empowerment.

TEXTBOOKS

1. Arun Monappa (2020). Industrial Relations. New Delhi: Tata McGraw- Hill Publishing companyLtd.
2. Mamoria C.B, Mamoria, G. (2021). Dynamics of Industrial Relations. New Delhi: HimalayanPublications,

REFERENCE BOOKS

1. Padhi,P.K. (2012).Labour &IndustrialLaws.NewDelhi:PHILearningP.Ltd.
2. Kapoor, N.D. (2014). Elements of Mercantile Law. New Delhi: S.Chand & Co.
3. Subramani, P N. &Rajendran, G. (2001). Human Resources Management and Industrial Relations. New Delhi: Himalaya PublishingHouse.
4. Pylee, P V. & A Simon George. (2007). Industrial relations and personnel Management.

New Delhi: Vikas Publishing House Pvt. Ltd., NewDelhi.

Course Outcomes

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

CO-PO Mapping

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

(A401601) DISASTER PREPAREDNESS & PLANNING MANAGEMENT

(Open Elective – I offered by Civil)

L	T	P	C
3	0	0	3

B.Tech (EEE)
Prerequisite: None

UNIT - I:

Introduction - Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation.

UNIT - II

Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes,tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT - III

Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.);health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT - IV

Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

UNIT - V

Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

TEXT BOOKS:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B.K., 2008, Handbook of Disaster Management: Techniques &Guidelines, Rajat Publication.
3. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

REFERENCE BOOKS:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority)
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California,EMSA no.214, June 2003
4. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health andPsychosocial Support in Emergency Settings. Geneva: IASC

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

1. Analyze impact of disasters
2. Identify the natural and manmade disasters and its vulnerability
3. Relate the disaster impacts at national and global context
4. Develop strategies to cope up with disasters.
5. Build disaster management plan

CO- PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	3	3	2	2	1	2	2	-	3	2	1	3
CO2	3	3	2	2	1	2	2	-	3	2	1	3
CO3	3	3	2	2	1	2	2	-	3	2	1	3
CO4	3	3	2	2	1	2	2	-	3	2	1	3
CO5	3	3	2	2	1	2	2	-	3	2	1	3

(A401602) ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective – I Offered by Civil)

L	T	P	C
3	0	0	3

B.Tech (EEE)
Prerequisite: None

UNIT - I:

Introduction: The Need for EIA, Indian Policies Requiring EIA, The EIA Cycle and Procedures, Screening, Scoping, Baseline Data, Impact Prediction, Assessment of Alternatives, Delineation of Mitigation Measure and EIA Report, Public Hearing, Decision Making, Monitoring the Clearance Conditions, Components of EIA, Roles in the EIA Process. Government of India Ministry of Environment and Forest Notification (2000), List of projects requiring Environmental clearance,Application form, Composition of Expert Committee, Ecological sensitive places, International agreements.

UNIT- II

EIA Methodologies: Environmental attributes -Criteria for the selection of EIA methodology, impact identification, impact measurement, impact interpretation & Evaluation, impact communication, Methods-Adhoc methods, Checklists methods, Matrices methods, Networks methods, Overlays methods. EIA review- Baseline Conditions -Construction Stage Impacts, post project impacts.

UNIT- III

Environmental Management Plan: EMP preparation, Monitoring Environmental Management Plan, Identification of Significant or Unacceptable Impacts Requiring Mitigation, Mitigation Plans and Relief & Rehabilitation, Stipulating the Conditions, Monitoring Methods, Pre- Appraisal and Appraisal.

UNIT- IV

Environmental Legislation and Life cycle Assessment: Environmental laws and protection acts, Constitutional provisions-powers and functions of Central and State government, The Environment (Protection) Act 1986, The Water Act 1974, The Air act 1981, Wild Life act 1972, Guidelines for controlof noise, loss of biodiversity, solid and Hazardous waste management rules. Life cycle assessment: Lifecycle analysis, Methodology, Management, Flow of materials-cost criteria case studies.

UNIT- V

Case Studies: Preparation of EIA for developmental projects- Factors to be considered in making assessment decisions, Water Resources Project, Pharmaceutical industry, thermal plant, Nuclear fuel complex, Highway project, Sewage treatment plant, Municipal Solid waste processing plant, Air ports.

TEXT BOOKS:

1. Anjaneyulu. Y and Manickam. V., EnCvironmental Impact Assessment Methodologies, B.S.Publications, Hyderabad, 2007
2. Barthwal, R. R., Environmental Impact Assessment, New Age International Publishers, 2002

REFERENCE BOOKS:

1. Jain, R.K., Urban, L.V., Stracy, G.S., Environmental Impact Analysis, Van NostrandReinhold Co.,New York, 1991.
2. Rau, J.G. and Wooten, D.C., Environmental Impact Assessment, McGraw Hill Pub.Co., New York,1996

COURSE OUTCOMES: On completion of the course students will be able to

1. Identify the attributes to be considered for EIA.
2. Assess impact of deforestation
3. Interpret impact prediction, significance of soil quality and mitigation.
4. Conduct environmental audit and prepare reports.
5. Illustrate environmental policies and provisions

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	2	-	-	2	-	3	2	-	3
CO2	3	1	-	2	-	-	2	-	3	2	-	3

CO3	3	1	-	2	-	-	2	-	3	2	-	3
CO4	3	1	-	2	-	-	2	-	3	2	-	3
CO5	3	1	-	2	-	-	2	-	3	2	-	3

(A404603) SENSORS & TRANSDUCERS
(Open Elective-II, Offered by ECE)

L	T	P	C
3	0	0	3

B.Tech(EEE)
Prerequisite: None

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/teethtype 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 andcomparison, Pyro electric type.

Unit – IV: Magnetic sensors: Sensor based on Villari effect for assessment of force, torque, proximity, Wiedemanneffect 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, Polarizationtypes, 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.Usherand D.A.Keating, MACMILLAN Press Ltd.

COURSE OUTCOMES:
At the end of the course the student will be able to:
1. Explain the basic concepts of mechanical and electromechanical sensors, their electrical characteristics.
2. Analyze various capacitor sensors, ultrasonic sensors their electrical characteristics.
3. Compare and elaborate various thermal sensors, principle of operation.
4. Distinguish various magnetic sensors based on their operations, radiation sensors and their operation.
5. Analyze various film sensors and operation of different nano sensors and their applications.

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

(A404604) IMAGE PROCESSING
(Open Elective-II, Offered by ECE)

L	T	P	C
3	0	0	3

B.Tech (EEE)
Prerequisite: None

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

Unit-II: Image Enhancement (Spatial Domain)
Introduction, Image Enhancement in Spatial domain, Enhancement through point operation,Types of point operation, Histogram manipulation, Linear and nonlinear gray level Transformation, Local or neighborhood operation ,Median filter, image Smoothing & Sharpening
Image Enhancement (Frequency Domain)
Filtering in Frequency domain, obtaining frequency domain filters from spatial filters, generating filters directly in the frequency domain, image Smoothing &Sharpening.

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

Unit- IV: Image Segmentation
Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation. Morphological Image Processing: Dilation and Erosion, Structuring Element Decomposition, Opening andClosing, 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 fundamentals of digital image processing.
2. Distinguish between spatial domain enhancement and frequency domain enhancement.
3. Explain various image degradation models for image restoration.
4. Analyze the image restoration and segmentation methods.
5. Discriminate between lossless and lossy compression techniques.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										1

CO2	**3**	**3**										**1**
CO3	**3**	**3**	**2**									**1**
CO4	**3**	**3**	**2**									**1**
CO5	**3**	**3**	**2**									**1**

(A402603) ELECTRIC VEHICLE TECHNOLOGY

(Open Elective-I1 offered by EEE)

L	T	P	C
3	0	0	3

B.Tech (EEE)

Prerequisites: Basics of Electrical Engineering (or equivalent subject)

Unit-I – Introduction to Hybrid Electric Vehicle:
Review of Conventional Vehicle: Introduction to Hybrid Electric Vehicles: Types of EVs, Hybrid Electric Drive-train, Tractive effort in normal driving

Unit-II – Electric Drives:
Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains, Electric Propulsion unit, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, switched reluctance motor

Unit- III– Energy Storage:
Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles:- Battery based energy storage andits analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system, Design of Hybrid Electric Vehicle and Plug-in Electric Vehicle.

Unit-IV- Energy Management System:
Energy Management Strategies, Automotive networking and communication, EV charging standards, V2G, G2V, V2B, V2H. Business: E-mobility business, electrification challenges, Business- E-mobility business,electrification challenges.

Unit- V – Mobility and Connectors:
Connected Mobility and Autonomous Mobility- case study Emobility Indian Roadmap Perspective. Policy: EVs in infrastructure system, integration of Evs in smart grid, social dimensions of Evs. Connectors- Types of EV charging connector, North American EV Plug Standards, DC Fast Charge EV Plug Standards in North America,CCS (Combined Charging System), CHAdeMO, Tesla, European EV Plug Standards.

Text books
1. Emadi, A. (Ed.), Miller, J., Ehsani, M., "Vehicular Electric Power Systems" Boca Raton, CRC Press, 2003
2. Husain, I. "Electric and Hybrid Vehicles" Boca Raton, CRC Press, 2010.

Reference Books
1. Larminie, James, and John Lowry, "Electric Vehicle Technology Explained" John Wiley and Sons, 2012
2. Tariq Muneer and Irene IllescasGarcía, "The automobile, In Electric Vehicles: Prospects and Challenges",Elsevier, 2017
3. Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles",Springer, 2013

Course outcomes: On completion of the course, students will be able to
1. Explain Hybrid Electric Vehicle technology
2. Understand the operation of various Electric Drives used in Hybrid Electric Vehicle
3. Illustrate various energy storage techniques in Hybrid Electric Vehicle
4. Gain Knowledge on Energy Management Strategies in Hybrid Electric Vehicle
5. Understand the different types of Mobility and Connectors in Hybrid Electric Vehicle

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3								2		
CO2	3	3								2		
CO3	3	3								2		
CO4	3	3								2		
CO5	3	3								2		

(A402604) BASICS OF POWER PLANT ENGINEERING
(Open Elective –II offered by EEE)

L	T	P	C
3	0	0	3

B.Tech (EEE)

Prerequisites: None

UNIT - I Coal Based Thermal Power Plants: Basic Rankine cycle and its modifications, layout of modern coalpower plant, super critical boilers, FBC boilers, turbines, condensers, steam and heating rates, subsystems of thermal power plants, fuel and ash handling, draught system, feed water treatment, binary cycles and cogeneration systems.

UNIT - II Gas Turbine and Combined Cycle Power Plants: Brayton cycle analysis and optimization, components of gas turbine power plants, combined cycle power plants, Integrated Gasifier based Combined Cycle (IGCC) systems.

UNIT - III Basics of Nuclear Energy Conversion: Layout and subsystems of nuclear power plants, Boiling Water Reactor (BWR), Pressurized Water Reactor (PWR), CANDU Reactor, Pressurized Heavy Water Reactor (PHWR), Fast Breeder Reactors (FBR), gas cooled and liquid metal cooled reactors, safety measures for nuclearpower plants.

UNIT - IV Hydroelectric Power Plants: Classification, typical layout and components, principles of wind, tidal,solar PV and solar thermal, geothermal, biogas and fuel cell power systems

UNIT - V Energy, Economic and Environmental Issues: Power tariffs, load distribution parameters, load curve,capital and operating cost of different power plants, pollution control technologies including waste disposal options for coal and nuclear plants.

TEXT BOOKS:
1. Nag P.K., Power Plant Engineering, 3rd ed., Tata McGraw Hill, 2008.
2. El Wakil M.M., Power Plant Technology, Tata McGraw Hill, 2010.

REFERENCE BOOK:
1. Elliot T.C., Chen K and Swanekamp R.C., Power Plant Engineering, 2nd ed., McGraw Hill, 1998.

Course Outcomes
On completion of the course, students will be able to
1. Understand the layout of and various components of Coal Based Thermal Power Plants
2. Understand the operation of Gas Turbine and Combined Cycle Power Plants
3. Illustrate the Nuclear Energy Conversion system
4. Explain the operation and Classification, typical layout and components of Hydroelectric PowerPlants
5. Understand the different parameters associated with Energy, Economic and Environmental Issues

CO- PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1					2	0	0	0
CO2	2	2	2	1					2	0	0	0
CO3	3	3	3	1					2	0	0	0
CO4	3	3	3	1					2	0	0	0
CO5	2	2	2	1					2			0

(A405601) FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS
(Open Elective-II Offered by CSE)

L	T	P	C
3	0	0	3

B. Tech (EEE)

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.

Textbooks:

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, Calyn 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.

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	**1**										
CO2	**2**	**2**	2	2	2							
CO3	**2**	**2**	2	2	2							
CO4	**2**	**2**	2	2	2							
CO5	**2**	**2**	2	2	2							

(A405605) WEB PROGRAMMING

(Open Elective-II Offered by CSE)

L	T	P	C
3	0	0	3

B.Tech(EEE)

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, NestedTables, 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 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), W3CXML 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.

TEXTBOOK:

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 indifferent 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.)

CO- PO MAPPING :

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		**2**	2	2	2							**2**
CO2		**2**	2	2	2							**2**
CO3		**2**	2	2	2				2			**2**
CO4		**2**	3	3	3				2	2		**3**
CO5		**2**	3	3	3				2	2		**3**

(A403603) FUNDAMENTALS OF MANUFACTURING PROCESSES

(Open Elective: Offered by Mechanical Engineering Department)

B.Tech(EEE)

L	T	P	C
3	0	0	3

Prerequisites: None

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. Methodsof 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 drawingand Tube drawing – coining – Hot and cold spinning. Types of presses and press tools. Forces and power requirementin 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 andresistance 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.

CO-PO MAPPING:

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

(A403604) FUNDAMENTALS OF AUTOMOBILE ENGINEERING

(Open Elective: Offered by Mechanical Engineering Department)

B.Tech(EEE)

L	T	P	C
3	0	0	3

Prerequisites: None

UNIT – I

Introduction: Components of four-wheeler automobile – chassis and body – power unit – power transmission rearwheel 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 – airfilters – 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 temperatureindicator 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 andtyres.

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.

CO-PO MAPPING:

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

A400603 – ENTREPRENEURSHIP

(Open Elective: Offered by Mechanical Engineering Department)

L	T	P	C
3	0	0	3

B.Tech(EEE)

Prerequisites: None

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- Stressand 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.

Reference Books

1. Rajeev Roy "Entrepreneurship" 3e, Oxford, 2020.
2. B.Janakiram and M.Rizwana" Entrepreneurship Development :Text & Cases, ExcelBooks, 1st Edition, 2011.
3. Stuart Read, Effectual Entrepreneurship, Routledge, 2nd Edition, 2016.
4. Robert Hisrich et al "Entrepreneurship" 6th e, TMH, 2012.

Course Outcomes

1. Identify the evolution and approaches of Entrepreneurship.
2. Analyze and develop the conceptualization of corporate Entrepreneurship Personality.
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.

CO- PO MAPPING :

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

A400604 - ETHICS IN BUSINESS & CORPORATE GOVERNANCE
(Open Elective offered by MBA)

L	T	P	C
3	0	0	3

Unit – I: Business Ethics in the Changing Environment: Business Ethics, Levels of Business Ethics, Myths about Business Ethics, 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 andAccounting Professionals, Ethics of Advertisement, Ethics of Media Reporting, Ethics of Healthcare Services. Ethical Dilemma, Mounting Scandals, Ethical Issues, Preparatory Ethics: Proactive Steps, Cyber Ethics.

Unit – III: Corporate Governance: Introduction to Corporate Governance, Major Corporate Governance Failures, Need for Corporate Governance, Corporate Governance in India, Theories of Corporate Governance: Agency Theory, Stewardship Theory and Stakeholder Theory, Problems of Governance in Companies, Role of Capital Markets, Regulator, Government in Corporate Governance.
Corporate Governance Codes and Committees: Global Reporting Initiative, OECD Principles, Cadbury Committee Report, Kumara Mangalam Birla Committee Report, Naresh ChandraCommittee Report, Narayana Murthy Committee Report, SEBI Clause 49 Guidelines, CorporateGovernance Committees.

Unit – IV: Role of Board: Types of Directors Functions of the Board, Structure of the Board, Role of the Board in Subcommittees, Audit, Compensation Committee, Role, Duties and Responsibilities of Directors, Conflicts of Interest, Remedial Actions. Governance Ratings, Merits and Demerits of Governance Ratings.

Unit – V: Corporate Social Responsibility (CSR): Models for Implementation of CSR, Scopeof CSR, Steps to attain CSR, Business Council for Sustainable Development (BCSD) India, Ethics and Social Responsibility of Business, Social Responsibility and Indian Corporations, CSRas a Business Strategy for Sustainable Development, CSR Committee, Recent Amendments in Companies Act (Sec: 135)

Text Books:

1. Jyotsna G B, R C Joshi, Business Ethics and Corporate Governance, TMH, 1e, 2019.
2. Martin J. Ossewaarde, Introduction to Sustainable Development, sage,1e,2018.

Reference Books

1. SK Mandal, Ethics in Business and Corporate Governance, TMH, 2/e,2017.
2. A.C. Fernando, Corporate Governance: Principles, Policies and Practices, 2nd Edition,Pearson,2018.
3. C.S.V. Murthy, Business Ethics, 1st Edition, Himalaya Publishing House,2019.
4. Joseph W.Weiss, Business Ethics, Thomson,2006.
5. K. Praveen Parboteeach, Business Ethics, Routledge,2019.

Course Outcomes: Students will be able to

1. Understand the Need for Business Ethics and Corporate Governance in India.
2. Apply Knowledge of Established Methodologies of Solving Professional Ethical Issues.
3. Learn Codes and Committees in Corporate Governance.
4. Understand the Role of Board in Corporate Governance.
5. Assess the Stakeholder perspective of Corporate Governance.

CO- PO MAPPING:

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

(A401603) REMOTE SENSING & GEOGRAPHICAL INFORMATION SYSTEMS
(Open Elective-II Offered by Civil Engineering Department**)**

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

Prerequisites: None

UNIT I

Introduction to Photogrammetry: Principles and types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement to 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. Electromagnetic 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 System: Introduction to GIS; components of a GIS; Geo spatial 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 fire; Data models for compost feature Object Based Vector Data Model; Classes and their Relationship; The geo-base data model; Geometric representation of Spatial Feature and data structure, Tomography 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, on version of Existing data, creating new data; remote sensing data, filed data.

Textbooks:
1. Remote Sensing and GIS, M. Anji Reddy JNTU Hyderabad, B.S. Publications.
2. Basics of remote sensing & GIS by A. Kumar, Laxmi publications.

References:
1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W Young, PHI.
2. Introduction to GIS, Kang,Tsurg Charg.Tata McGraw Hill Education Private Ltd.

COURSE OUTCOMES: On completion of the course students will be able to

1. Illustrate the principles of photogrammetry
2. Make use of remote sensing process
3. Utilize GIS principles in real life
4. Explain the concepts of topology, OBVDM and tomography
5. Develop the geospatial data model with various file formats

CO- PO MAPPING :

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

(A401604)-SOLID WASTE MANAGEMENT
(Open Elective-II Offered by Civil Engineering)

B.Tech(EEE)

L	T	P	C
3	0	0	3

Prerequisites: None

UNIT - I

Solid Waste: Definitions, Types of solid wastes, sources of solid wastes, Characteristics, and perspectives; properties of solid wastes, Sampling of Solid wastes, Elements of solid waste management - Integrated solid waste management, Solid Waste Management Rules 2016.

UNIT - II

Engineering Systems for Solid Waste Management: Solid waste generation; on-site handling, storage and processing; collection of solid wastes; Stationary container system and Hauled container systems –Route planning - transfer and transport; processing techniques.

UNIT- III

Engineering Systems for Resource and Energy Recovery: Processing techniques; materials recovery systems; recovery of biological conversion products – Composting, pre and post processing, types of composting, Critical parameters, Problems with composing - recovery of thermal conversion products; Pyrolisis, Gasification, RDF - recovery of energy from conversion products; materials and energy recovery systems.

UNIT- IV

Landfills: Evolution of landfills – Types and Construction of landfills – Design considerations – Life oflandfills- Landfill Problems – Lining of landfills – Types of liners – Leachate pollution and control – Monitoring landfills – Landfills reclamation.

UNIT- V

Hazardous waste Management: – Sources and characteristics, Effects on environment, Risk assessment
– Disposal of hazardous wastes – Secured landfills, incineration - Monitoring – Biomedical waste disposal, E-waste management, Nuclear Wastes, Industrial waste Management

TEXT BOOKS:

1. Tchobanoglous G, Theisen H and Vigil SA ‘Integrated Solid Waste Management,EngineeringPrinciples and Management Issues’ McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, ‘Solid Waste Engineering’ Brooks/ColeThomson LearningInc., 2002.

REFERENCE BOOKS:

1. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, ‘Environmental Engineering’,McGraw Hill Inc.,New York, 1985.
2. Qian X, Koerner RM and Gray DH, ‘Geotechnical Aspects of Landfill Designand Construction’Prentice Hall, 2002.

COURSE OUTCOMES: On completion of the course students will be able to

1. Explain the sources of solid waste and its impact.
2. Describe the process of solid waste and its management.
3. Illustrate the process of handling hazardous waste.
4. Classify various biomedical waste management systems.
5. Apply e-waste management techniques.

CO- PO MAPPING:

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

(A404605) FUNDAMENTALS OF EMBEDDED SYSTEMS

(Open Elective-III offered by ECE)

L	T	P	C
3	0	0	3

B.Tech(EEE)

Prerequisites: None

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

TEXTBOOK:

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 their applications.
2. Compare various types of memories, sensors and Input / Output devices.
3. Summarize 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.

CO-PO MAPPING:

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

(A404606) DATA COMMUNICATIONS

(Open Elective-III Offered by ECE)

L	T	P	C
3	0	0	3

B. Tech (EEE)
Prerequisites: None

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 versusmetallic 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.

TEXTBOOKS:
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.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2									2
CO2	3	3	2									2
CO3	3	3	2									2
CO4	3	3	2									2
CO5	3	3	2									2

(A402605) NANO TECHNOLOGY
(Open Elective-III offered by EEE)

B. Tech (EEE)

L	T	P	C
3	0	0	3

Prerequisites: None

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, andFuture Prospects.

UNIT II: UNIQUE PROPERTIES OF NANOMATERIALS
Microstructure and Defects in Nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple and declinations, Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility. Magnetic Properties: Soft magnetic nanocrystalline alloy, Permanent magnetic nano-crystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

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, Foodand 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 andJames 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, McGraw- 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. ChallaS., 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 nanomaterials.
3. Identify the synthesis routes of nanomaterials.
4. Make use of the tools to characterize the nanomaterials.
5. Utilize the nano-materials for various applications

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2						2		
CO2	3	3	3							2		
CO3	3	3								2		
CO4	3	3			2					2		
CO5	3	3								2		

(A402606) EV BATTERIES & CHARGING SYSTEM
(Open Elective-III Offered By EEE)

L	T	P	C
3	0	0	3

B. Tech (EEE)

Prerequisites: Basics of Electrical Engineering (or equivalent subject)

UNIT I - Battery parameters:
Cell and battery voltages, Charge (or Amphour) capacity, Energy stored, Energy density, Specific power, Amphour (or charge) efficiency, Energy efficiency, Self-discharge rates, Battery geometry, Battery temperature,heating and cooling needs, Battery life and number of deep cycles

UNIT II – EV Batteries:
Lead Acid Batteries Lead acid battery basics, Special characteristics of lead acid batteries, Battery life and maintenance, Battery charging, Summary Nickel-based Batteries Introduction, Nickel cadmium, Nickel metal hydride batteries

UNIT III– Sodium, Lithium and Metal air batteries:
Sodium-based Batteries Introduction, Sodium sulphur batteries, Sodium metal chloride (Zebra) batteries LithiumBatteries Introduction, The lithium polymer battery, The lithium ion battery Metal Air Batteries Introduction, Thealuminium air battery, The zinc air battery

UNIT IV– Charging Infrastructure:
Domestic Charging Infrastructure, Public Charging Infrastructure, Normal Charging Station, Occasional Charging Station, Fast Charging Station, Battery Swapping Station, Move-and-charge zone.

UNIT V– EV Charging Battery Chargers:
Charge equalisation, Conductive (Basic charger circuits, Microprocessor based charger circuit. Arrangement of an off-board conductive charger, Standard power levels of conductive chargers, Inductive (Principle of inductivecharging, Soft-switching power converter for inductive charging), Battery indication methods

TEXT BOOKS

1. James Larminie Oxford Brookes University, Oxford, UK John Lowry Acenti Designs Ltd., UK, Electric Vehicle Technology Explained
2. C.C Chan, K.T Chau: Modern Electric Vehicle Technology, Oxford University Press Inc., New York 2001.

REFERENCE BOOKS:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
2. MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
3. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.

COURSE OUTCOMES

On completion of the course, students will be able to

1. Gain knowledge on various battery parameters
2. Classify different types of EV batteries.
3. Illustrate Sodium, Lithium and Metal air batteries.
4. Understand the different types of Charging Infrastructure.
5. Understand the operation of EV Charging Battery Chargers

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3								2		
CO2	3	3								2		
CO3	3	3								2		
CO4	3	3								2		
CO5	3	3								2		

(A405603) FUNDAMENTALS OF COMPUTER NETWORKS

(Open Electeive-III Offered by CSE)

L	T	P	C
3	0	0	3

B. Tech (EEE)

Prerequisites: None

UNIT-I

Fundamental of Data Communication and Computer Network: Components, Data Representation, Data Flow, Data and Signal, Classification Network: LAN, WAN, MAN, **Network Architecture:** Peer to Peer, Client Server Network, History of Internet.

UNIT-II

Network Model: OSI Reference Model and TCP/IP Protocol Suit
Network Connecting Devices: Hub, Switch, Router, Repeater, Bridge, Gateway, Modem
Network Topologies: Types of Topology-Bus, Ring, Star, Mesh, Tree, Hybrid, and IEEE Standards.

UNIT-III

Physical Layer: Guided Transmission Media and Unguided Transmission Media
Data Link Layer: Design Issues, Error Detection and Correction, Simplex Stop and wait protocol.

UNIT-IV

Network Layer: Design Issues, Routing Algorithm: Shortest Path Routing algorithm, Congestion Control, IPv4,IPv6, DHCP
Transport Layer: Process to process Delivery, Addressing, UDP and TCP, Error control and flow control.

UNIT-V

Application Layer: Domain Name System, E-Mail, FTP, WWW and Http.
Network Security: Cryptography, Symmetric Key and Public Key, Firewall, VPN, Web Security

TEXTBOOKS:

1. Computer Networks, Andrew S Tanenbaum, David. j. Wetherall, 5th Edition.Pearson Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan. 3rd Edition, TMH.

REFERENCE BOOKS:

1. An Engineering Approach to Computer Networks, S. Keshav, 2nd Edition, Pearson Education.
2. Computer Networking A Top-Down Approach – Kurose James F, Keith W, 6th Edition, Pearson
3. Data communication and Networks - Bhusan Trivedi, Oxford university press, 2016.

COURSE OUTCOMES:

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

1 Explain the Data in communication and two types of networks architecture.
2 Compare OSI Reference model and TCP/IP Protocol Suit and able to Sketch the different topologies andnetwork connecting devices.
3 Describe about Transmission media in Physical layer and Analyze the Error detection and correctionmethods in Data link layer.
4 Apply knowledge in developing routing algorithm and Explain transport layer protocols.
5 Examine the Application layer Protocols and Analyze various network security approaches.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2		2								
CO2	2	2		2								
CO3	2	2		2								
CO4	2	2	2	2								
CO5	2	2	2	2								

(A405606) FUNDAMENTALS OF DEVOPS
(OPEN ELECTEIVE-III Offered by CSE)

L	T	P	C
3	0	0	3

B. Tech (EEE)
Prerequisites: None

UNIT - I
Introduction: Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT - II
Software development models and DevOps: DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.
DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

UNIT - III
Introduction to project management: The need for source code control, The history of source code management, Roles and code, source code management system and migrations, Shared authentication, Hosted Git servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab.

UNIT - IV
Integrating the system: Build systems, Jenkins build server, managing build dependencies, Jenkins plugins, and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and build pipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternative build servers, Collating quality measures.

UNIT - V
Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development Deployment of the system: Deployment systems, Virtualization stacks, code execution atthe client, Puppet master and agents, Ansible, Deployment tools: Chef, Salt Stack and Docker

TEXTBOOKS:
1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

REFERENCE BOOK:
1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. AddisonWesley; ISBN-10

Course Outcomes:
On successful completion of this course, students will be able to:
1. Identify components of Devops environment
2. Describe Software development models and architectures of DevOps
3. Apply different project management, integration, testing and code deployment tool
4. Investigate different DevOps Software development models
5. Assess various Devops practices
6. Collaborate and adopt Devops in real-time projects

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1					2							**2**
CO2		**3**										**2**
CO3			3	3							2	**2**
CO4			3	3					1	1	2	**2**
CO5				3					2	1	2	**2**

(A403605) INDUSTRIAL SAFETY ENGINEERING
(Open Elective: Offered by Mechanical Engineering Department)

L	T	P	C
3	0	0	3

B.Tech(EEE)
Prerequisites: None

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 oftools 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-typesand 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 ofelectric 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 equipment.
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 equipment's.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	3	3	3	3	1	-	-	-	1	-	3	3
CO2	3	3	3	3	1	-	-	-	1	-	3	3

CO3	3	3	3	3	1	-	-	-	1	-	3	3
CO$	3	3	3	3	1	-	-	-	1	-	3	3
CO5	3	3	3	3	1	-	-	-	1	-	3	3

(A403606) WASTE TO ENERGY

(Open Elective: Offered by Mechanical Engineering Department)

L	T	P	C
3	0	0	3

Prerequisites: None

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 arrangementand 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.

TEXTBOOKS:

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, TataMcGraw 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.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	2	3	3	3	2	1	2	-	2	-	-	2
CO2	3	2	2	3	3	1	2	-	2	-	-	2
CO3	3	3	1	3	1	1	2	-	2	-	-	2
CO4	3	3	1	3	1	1	2	-	2	-	-	2
CO5	3	2	1	3	2	1	2	-	1	-	-	2

(A400605) - BASICS OF MARKETING

(Open Elective: Offered by MBA Department)

L	T	P	C
3	0	0	3

B.Tech(EEE)
Prerequisites: None

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:

- Marketing Management, Philip Kotler, Kevin Lane Keller, Pearson

REFERENCES BOOKS:

1. Rosalind Masterson, Nichola Philips, David Pickton, Marketing : An Introduction, 5e, Sage Publications, 2021.
2. G. Shainesh Philip Kotler, Kevin Lane Keller, Alexander Cherneb, Jagdish N Sheth, Marketing Management, 16e, Pearson, 2022.
3. Lamb, Hair, Sharma, Mc Daniel: MKTG, A South Asian Perspective, Cengage Learning, 2016. (For PPT, Case Solutions, video cases, Faculty may visit : login.cengage.com)
4. Philip Kotler, Gray Armstrong, Principles of Marketing, Pearson Education, 18e,2020.
5. Ramaswamy, Namakumari, Marketing Management, Sage Publications, 6e, 2018.
6. Arun Kumar & N. Meenakshi, Marketing Management , Vikas, 3e, 2016

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Analyze the scope, concepts of Marketing and forecasting techniques in presentGlobal Market Environment.
2. Outline marketing research, consumer behaviour, segmentation and targeting.
3. Develop conceptual knowledge on new product development, marketing mix andpromotional mix
4. Illustrate marketing channels of distribution and logistics
5. Identify the skills and importance of sales management.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	-	3	3	-	2	3	-	-	-	3	-	-
CO2	-	-	-	-	3	3	-	3	-	-	2	-
CO3	-	-	-	-	-	3	2	-	3	-	3	-
CO4	-	-	3	-	-	-	-	-	3	-	2	-
CO5	3	-	-	-	-	-	3	-	-	3	-	-

(A462602) Cloud Computing

(Open Elective-III Offered by CSC)

L	T	P	C
3	0	0	3

Prerequisites: None

B.Tech(EEE)

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

TEXTBOOKS:

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, rp 2011.

Course Outcomes

The student shall be able to

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

CO- PO MAPPING:

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

(A401605) ENERGY EFFICIENT BUILDINGS
(Open Elective-III Offered by Civil)

B.Tech (EEE)

L	T	P	C
3	0	0	3

Prerequisites: None

UNIT I

Climates and buildings, Thermal properties and energy content of building materials, Psychrometry, thermal comfort: Criteria and various parameters, Air conditioning systems, Energy conservation techniques in Air conditioning systems. Climate and comfort zones, Introduction to the design of shading devices, Overhangs. Factors that effects energy use in buildings: ventilation and its significance.

UNIT II

Passive and active methods of heating and cooling, Passive heating concepts: direct heat gain, indirect heat gain, isolated gain and sunspaces. Passive cooling concepts: evaporative cooling, radiative cooling;application of wind, water and earth for cooling; shading, paints and cavity walls for cooling; roof radiation traps; earth air-tunnel.

UNIT III

Heat transmission in buildings: surface co-efficient: air cavity, Internal and external surfaces Overall thermal transmittance, Wall and windows; Heat transfer due to ventilation/infiltration, Internal heat transfer; Decrement factor; Phase lag; Lighting (Daylighting and Electric lighting), Design of day- lighting, Concept of sol-air temperature and its significance.

UNIT IV

Estimation of building loads, Steady state method, Network method, Numerical method, Correlations. Energy conservation through site selection, Planning and design; Siting and orientation Green buildings, Zero emission buildings. Energy Efficient Landscape Design: Modification of microclimatic through landscape element for energy conservation.

UNIT V

Bioclimatic classification of India; Passive concepts appropriate for the various climatic zones in India;Typical design of selected buildings in various climatic zones; Thumb rules for design of buildings andbuilding codes Energy Efficient Landscape Design: Modification of microclimatic through landscape element for energy conservation

TEXT BOOKS:

1. Tiwari G N, Goyal R K, Greenhouse Technology: Fundamentals, Design Modelingand Application, NarosaPublishing House.
2. Krieder J, Rabi A, Heating and Cooling of Buildings: Design for Efficiency, McGrawHill.

REFERENCE BOOKS:

1. Archie, Culp W, Principles of Energy Conservation, McGraw Hill.
2. Callaghan P O, Energy Management, McGraw - Hill Book Company.
3. Williams J R, Passive Solar Heating, Ann Arbar Science.
4. Majumder Milli, Energy Efficient Buildings, TERI, New Delhi.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Identify different Energy conservation techniques in Air conditioning systems.
2. demonstrate a good ability to calculate the energy balance of buildings.
3. assess whether there is a potential conflict between energy conservation and indoor climate for different energy saving measures.
4. evaluate different opportunities to save energy with measures regarding both building technology and building services engineering.
5. able to design different buildings in various climatic zones.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	3	3	-	2	3	3	-	-	3	2	-	3
CO2	3	3	-	2	3	3	-	-	3	2	-	3

CO3	3	3	-	2	3	3	-	-	3	2	-	3
CO4	3	3	-	2	3	3	-	-	3	2	-	3
CO5	3	3	-	2	3	3	-	-	3	2	-	3

(A401606) ENVIRONMENTAL POLLUTION
(Open Elective-III Offered by Civil)

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

Prerequisites: None

UNIT - I

Air Pollution: Air pollution Control Methods – Particulate control devices – Methods of Controlling Gaseous Emissions–Air quality standards. Noise Pollution: Noise standards, Measurement and control methods –Reducing residential and industrial noise –ISO: 14000.

UNIT - II

Industrial waste water Management: Strategies for pollution control –Volume and Strength reduction –Neutralization –Equalization – Proportioning –Common Effluent Treatment Plants –Recirculation of industrial wastes –Effluent standards.

UNIT - III

Solid Waste Management: Solid Waste Management: solid waste characteristics –basics of on-site handling and collection – separation and processing –Incineration-Composting-Solid waste disposal methods –fundamentals of Land filling. Hazardous Waste: Characterization –Nuclear waste –Biomedical wastes –Electronic wastes –Chemical wastes –Treatment and management of hazardous waste-Disposal and Control methods.

UNIT - IV

Environmental Sanitation: Environmental Sanitation: Environmental Sanitation Methods for Hostels and Hotels, Hospitals, Swimming pools and public bathing places, social gatherings (melas and fares), Schools and Institutions, Rural Sanitation-low cost waste disposal methods.

UNIT - V

Sustainable Development: Sustainable Development: Definition-elements of sustainable developments-Indicators of sustainable development-Sustainability Strategies-Barriers to Sustainability–Industrialization and sustainable development – Cleaner production in achieving sustainability-sustainable development.

TEXT BOOKS

1. Peavy, H. S., Rowe, D.R, Tchobanoglous, "Environmental Engineering", G. Mc - Graw HillInternational Editions, New York 1985..
2. G. Henry and G.W. Heinke, "Environmental Science and Engineering", Pearson Education.

REFERENCE BOOKS

1. G. L. Karia and R.A. Christian, "Waste water treatment-concepts and design approach", PrenticeHallof India
2. M.N.Rao and H.V.N. Rao, "Airpollution", Tata Mc.GrawHill Company.
3. Ruth F. "Weiner andRobin Matthews Environmental Engineering", 4thEdition Elesevier, 2003.
4. K. V. S. G. Murali Krishna, "Air Pollution and Control"by, Kousal & Co. Publications, New Delhi.

COURSE OUTCOMES: On completion of the course students will be able to

1. define the air pollution control methods.
2. able to evaluate Volume and Strength reduction.
3. identify the different ways to dispose Solid waste.
4. Identify the sanitation methods.
5. Products that accelerate more sustainable lifestyles

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	3	3	-	2	-	2	3	-	3	2	-	3

CO2	3	3	-	2	-	2	3	-	3	2	-	3
CO3	3	3	-	2	-	2	3	-	3	2	-	3
CO4	3	3	-	2	-	2	3	-	3	2	-	3
CO5	3	3	-	2	-	2	3	-	3	2	-	3