SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES

(AUTONOMOUS)

Dr. Visweswaraiah Road, (Bangalore-Tirupathi Bye-pass Road),
Murukambattu, Chittoor – 517127, Andhra Pradesh, India.

B.Tech
Course Structures and Syllabi
Under R23 Regulations

(Applicable for 2023-2024 Regular Students & 2024-2025 Lateral Students)

Department of
Electrical and Electronics Engineering

INSTITUTE VISION

To emerge as a Centre of Excellence for Learning and Research in the domains of Engineering, Computing and Management.

INSTITUTE MISSION

- Provide congenial academic ambience with state-art of resources for learning and research.
- Ignite the students to acquire self-reliance in the latest technologies.
- Unleash and encourage the innate potential and creativity of students.
- Inculcate confidence to face and experience new challenges.
- Foster enterprising spirit among students.
- Work collaboratively with technical Institutes / Universities / Industries of National and International repute

DEPARTMENT VISION

To excel in the domains of electrical and electronics engineering through academic excellence, research innovation, actively addressing challenges, developing sustainable solutions, and making a Positive societal impact, with the aim of further strengthening research and promoting holistic development among students.

DEPARTMENT MISSION

- Provide quality education and training in electrical and electronics engineering.
- Foster research and innovation in the field.
- Address real-world challenges with sustainable solutions.
- Promote holistic development and ethical values.
- Enhance industry collaborations and practical learning opportunities.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To cultivate graduates of the EEE program with a strong foundation in electrical and electronics engineering principles and practices, equipping them with the knowledge and skills necessary for successful careers or further studies in the field **(Competent Professional)**

PEO2: To develop graduates who can conduct research, innovate, and apply their knowledge effectively to address real-world challenges in electrical and electronics engineering, contributing to technological advancements and sustainable solutions **(Innovative Engineers)**

PEO3: To foster graduates who demonstrate professionalism, ethical conduct, leadership qualities, effective communication, and teamwork skills, enabling them to make a Positive societal impact, engage in lifelong learning, and adapt to the evolving needs of the industry. **(Professionally Ethical and adaptable Leadership)**

PROGRAMME OUTCOMES (PO's)

On Successful completion, the graduate will be able to,

PO1 **Engineering Knowledge:** Apply the knowledge of mathematics, natural science, computing, and engineering fundamentals and an engineering specialisation to the solution of complex engineering problems.

PO2 **Problem Analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3 **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.

PO4 **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5 **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6 **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7 **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 **Individual and Collaborative Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 **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.

PO11 **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.

PO12 **Life-Long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO's)

On Successful completion, the graduate will be able to,

PSO1: Graduates will demonstrate proficiency in applying electrical and electronics engineering principles and practices to design, analyze, and implement solutions in diverse application areas.

PSO2: Graduates will Possess research aptitude, innovation skills, and the ability to address real-world challenges by developing sustainable solutions in the field of electrical and electronics engineer.

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
(NBA Accredited)

Academic Regulations (R23) for B. Tech (Regular-Full time)

(Effective for the students admitted into I year from the Academic Year2023-2024 onwards)

1. AWARD OF THE DEGREE

(a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:

(i) Pursues a course of study for not less than four academic years and not more than eight academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Eight years).

(ii) Registers for **160 credits** and **secures all 160 credits**.

(b) Award of B.Tech. degree with Honors
A student will be declared eligible for the award of the B.Tech. with Honors if he/she fulfils the following:

(i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 160 credits.

(ii) Registering for Honors is optional.

(iii) Honors is to be completed simultaneously with B.Tech. programme.

Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled. This clause shall be read along with clause 1 a) i).

2. ADMISSIONS

Admission to the B. Tech Program shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either based on the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

3. PROGRAM RELATED TERMS

Credit: A unit by which the course work is measured. It determines the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.

4. Credit definition:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hrs. Practical (Lab) per week	1 credit

a) **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.

b) **Choice Based Credit System (CBCS):** The CBCS provides a choice for students to select from the prescribed courses.

5. SEMESTER/CREDITS:

i) A semester comprises 90 working days and an academic year is divided into two semesters.

ii) The summer term is for eight weeks during summer vacation. Internship/ apprenticeship

/ work-based vocational education and training can be carried out during the summer term, especially by students who wish toexit after two semesters or four semesters of study.

iii) Regular courses may also be completed well in advance through MOOCs satisfying prerequisites.

6. STRUCTURE OF THE UNDERGRADUATE PROGRAMME

All courses offered for the undergraduate program (B. Tech.) are broadly classified as follows:

S.No.	Category	Breakup of Credits (Total 160)	Percentage of total credits	AICTE Recommendation (%)
1.	Humanities and Social Science including Management (HM)	13	8 %	8 – 9%
2.	Basic Sciences (BS)	20	13 %	12 - 16%
3.	Engineering Sciences (ES)	23.5	14%	10 – 18%
4.	Professional Core (PC)	54.5	34 %	30 – 36%
5.	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC)	33	21 %	19 - 23%
6.	Internships & Project work (PR)	16	10 %	8 – 11%
7.	Mandatory Courses (MC)	Non-credit	Non-credit	-

7. COURSE CLASSIFICATION:

All subjects/ courses offered for the undergraduate programme in Engineering &Technology (B.Tech. degree programmes) are broadly classified as follows:

S.No.	Broad Course Classification	Course Category	Description
1.	Foundation Core Courses	Foundation courses	Includes Mathematics, Physics and Chemistry. Fundamental engineering courses; humanities, social sciences, and management courses
2.	Core Courses	Professional Core Courses (PC)	Includes subjects related to the parent discipline / department /branch of Engineering.
3.	Elective Courses	Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline/department/ branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include interdisciplinary Subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering
		Domain Specific skill Enhancement Courses (SEC)	Interdisciplinary/Job-oriented/domain courses which are relevant to the industry
4.	Project & Internships	Project	B.Tech. Project or Major Project
		Internships	Summer Internships – Community based and Industry Internships; Industry oriented Full Semester Internship
5.	Audit Courses	Mandatory non-credit Courses	Covering subjects of developing desired attitude among the learners

8. PROGRAMME PATTERN

i. Total duration of the of B. Tech (Regular) Programme is four academic years.

ii. Each academic year of study is divided into two semesters.

iii. Minimum number of instruction days in each semester is 90 days.

iv. There shall be mandatory student induction program for freshers, with a three- week duration before the commencement of first semester. Physicalactivity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.

v. Health/wellness/yoga/sports and NSS /NSS /Scouts & Guides / Community service activities are made mandatory as credit courses for all the undergraduate students.

vi. Courses like Environmental Sciences, Indian Constitution, Technical Paper Writing & IPR are offered as non-credit mandatory courses for all the undergraduate students.

vii. Design Thinking for Innovation & Tinkering Labs are made mandatory as credit courses for all the undergraduate students.

viii. Increased flexibility for students through an increase in the elective component of the curriculum, with 05 Professional Elective courses and 04Open Elective courses.

ix. Professional Elective Courses, include the elective courses relevant to the chosen specialization/branch. Proper choice of professional elective courses can lead to students specializing in emerging areas within the chosen field of study.

x. A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for B.Tech. Degree with a Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.

xi. While choosing the electives, students shall ensure that they do not opt for the courses with syllabus contents similar to courses already pursued.

xii. A pool of interdisciplinary/job-oriented/domain skill courses which are relevant to the industry are integrated into the curriculum of all disciplines. There shall be 05 skill-oriented courses offered during III to VI semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain/interdisciplinary courses and the other shall be a soft skills course.

xiii. Students shall undergo mandatory summer internships, for a minimum of eight weeks duration at the end of second and third year of the programme. The internship at the end of second year shall be community oriented and industry internship at the end of third year.

xiv. There shall also be mandatory full internship in the final semester of the programme along with the project work.

xv. Undergraduate degree with Honors is introduced by the Institution for the students having good academic record.

xvi. Departments shall take measures to implement Virtual Labs(https://www.vlab.co.in) which provide remote access to labs in various disciplines of Engineering and will help student in learning basic and advanced concept through remote experimentation. Student shall be made to work on virtual lab experiments during the regular labs.

xvii. Institution shall assign a faculty advisor/mentor after admission to a group of students from same department to provide guidance in courses registration/career growth/placements/opportunities for higher studies/GATE/other competitive exams etc.

xviii. Preferably 25% of course work for the theory courses in every semester shall be conducted in the blended mode of learning.

9. EVALUATION PROCESS

The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. Summer Internships shall be evaluated for 50 marks, Full Internship & Project work in final semester shall be evaluated for 200 marks, mandatory courses with no credits shall be evaluated for 30 mid semester marks.

A student has to secure not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester and end examination marks taken together for the theory, practical, design, drawing subject or project etc. In case of a mandatory course, he/she should secure 40% of the total marks.

Theory Courses:

Assessment Method	Marks
Continuous Internal Assessment (CIA)	30
Semester End Examination (SEE)	70
Total	100

i) For theory subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination.

ii) For practical subject, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End- Examination.

iii) If any course contains two different branch subjects, the syllabus shall be written in two parts with 3 units each (Part-A and Part-B) and external examination question paper shall be set with two parts each for 35 marks.

iv) If any subject is having both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given same subject code with an extension of 'T' for theory subject and 'P' for practical subject.

a) Continuous Internal Evaluation

i) For theory subjects, during the semester, there shall be two midterm examinations. Each midterm examination shall be evaluated for 30 marks of which 10 marks for objective paper (20 minutes duration), 15 marks for subjective paper (90 minutes duration) and 5 marks for assignment.

ii) Objective paper shall contain for 05 short answer questions with 2 marks each or maximum of 20 bits for 10 marks. Subjective paper shall contain 3 either or type questions (totally six questions from 1 to 6) of which student has to answer one from each either-or type of questions. Each question carries 10 marks. The marks obtained in the subjective paper are condensed to 15 marks.

Note:

- The objective paper shall be prepared in line with the quality of competitive examinations questions.
- The subjective paper shall contain 3 either or type questions of equal weight age of 10 marks. Any fraction shall be rounded off to the next higher mark.
- The objective paper shall be conducted either online or offline by the respective institution on the day of subjective paper test.
- If conducted offline, the midterm examination shall be conducted first by distribution of the Objective paper, simultaneously marking the attendance, after 20 minutes the answered objective paper shall be collected back. The student is not allowed to leave the examination hall. Then the descriptive question paper and the answer booklet shall be distributed. After 90 minutes the answered booklets are collected back.
- Assignments shall be in the form of problems, mini projects, design problems, slip tests, quizzes etc., depending on the course content. It should be continuous assessment throughout the semester and the average marks shall be considered.

iii) If the student is absent for the mid semester examination, no re-exam shall be conducted and mid semester marks for that examination shall be considered as zero.

iv) First midterm examination shall be conducted for I, II units of syllabus with one either or type question from each unit and third either or type question from both the units. The second midterm examination shall be conducted for III, IV and V units with one either or type question from each unit.

v) Final mid semester marks shall be arrived at by considering the marks secured by the student in both the mid examinations with 80% weightage given to the better mid exam and 20% to the other.

For Example:

Marks obtained in first mid: 25 Marks obtained in second mid: 20 Final mid semester Marks: (25x0.8) + (20x0.2) = 24

If the student is absent for any one midterm examination, the final mid semester marks shall be arrived at by considering 80% weightage to the marks secured by the student in the appeared examination and zero to the other.

For Example:

Marks obtained in first mid: Absent Marks obtained in second mid: 25 Final mid semester Marks: (25x0.8) + (0x0.2) =20

b) End Examination Evaluation:

End examination of theory subjects shall have the following pattern:

i) There shall be 6 questions and all questions are compulsory.

ii) Question I shall contain 10 compulsory short answer questions for a total of 20marks such that each question carries 2 marks.

iii) There shall be 2 short answer questions from each unit.

iv) In each of the questions from 2 to 6, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.

v) The questions from 2 to 6 shall be set by covering one unit of the syllabus for each question.

End examination of theory subjects consisting of two parts of different subjects, for Example: Basic Electrical & Electronics Engineering and Basic Civil & Mechanical Engineering shall have the following pattern:

i) Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.

ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1mark.

iii) In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.

iv) The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

Practical Courses:

Assessment Method	Marks
Continuous Internal Assessment (CIA)	30
Semester End Examination (SEE)	70
Total	100

a) For practical courses, there shall be a continuous evaluation during the semester for 30 sessional marks and end examination shall be for 70 marks.

b) Day-to-day work in the laboratory shall be evaluated for 15 marks by the concerned laboratory teacher based on the regularity/record/viva and 15 marks for the internal test.

c) The end examination shall be evaluated for 70 marks, conducted by the concerned laboratory teacher and a senior expert in the subject from the same department.

- Procedure: 20 marks
- Experimental Work & Results: 30 marks
- Viva voce: 20 marks.

In a practical subject consisting of two parts (Eg: Basic Electrical &Electronics Engineering Lab), the end examination shall be conducted for 70 marks as a single laboratory in 3 hours.

The end examination shall be evaluated 35 marks in each part. Mid semester examination shall be evaluated as above for 30 marks (day-to- day evaluation 15 marks and internal examination 15 marks) in each part and final internal marks shall be arrived by considering the average of marks obtained in two parts.

d) For the subject having design and/or drawing, such as Engineering Drawing, the distribution of marks shall be 30 for mid semester evaluation and 70 for end examination.

Assessment Method	Marks
Continuous Internal Assessment (CIA)	30
Semester End Examination (SEE)	70
Total	**100**

Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher based on the reports/submissions prepared in the class. And there shall be two midterm examinations in a semester for duration of 2 hours each for 15 marks with weightage of 80% to better mid marks and 20% for the other. The subjective paper shall contain 3 either or type questions of equal weightage of 5 marks. There shall be no objective paper in mid semester examination. The sum of day-to-day evaluation and the mid semester marks will be the final sessional marks for the subject.

The end examination pattern for Engineering Graphics, shall consists of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end examination. However, the end examination pattern for other subjects related to design/drawing, multiple branches, etc is mentioned along with the syllabus.

e) There shall be no external examination for mandatory courses with zero credits. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case, the student fails, a re-examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.

f) The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.

10. SKILL ORIENTED COURSES

i) There shall be five skill-oriented courses offered during III to VII semesters.

ii) Out of the five skill courses two shall be skill-oriented courses from the same domain. Of the remaining three skill courses, one shall be a soft skill course and the remaining two shall be skill-advanced courses from the same domain/Interdisciplinary/Job oriented.

iii) The course shall carry 100 marks and shall be evaluated through continuous assessments during the semester for 30 sessional marks and end examination shall be for 70 marks. Day-to-day work in the class / laboratory shall be evaluated for 30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.

iv) The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process.

The marks/grades shall be assigned to the students by the above committee based on their performance.

v) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency. A committee shall be formed at the level of the college to evaluate the grades/marks given fora course by external agencies and convert to the equivalent marks/grades.

vi) The recommended courses offered by external agencies, conversions and appropriate grades/marks are to be approved by the University at the beginning of the semester. The principal of the respective college shall forward such proposals to the University for approval.

vii) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the University.

11. MASSIVE OPEN ONLINE COURSES (MOOCS):

A Student has to pursue and complete one course compulsorily through MOOCs approved by the Institution. A student can pursue courses other than core through MOOCs and it is mandatory to complete one course successfully through MOOCs for awarding the degree. A student is not permitted to register and pursue core courses through MOOCs.
A student shall register for the course (Minimum of either 8 weeks or 12 weeks) offered through MOOCs with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's progression. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. Examination fee, if any, will be borne by the student.

Students who have qualified in the proctored examinations conducted through MOOCs platform can apply for credit transfer as specified and are exempted from appearing internal as well as external examination (for the specified equivalent credit course only) conducted by the university. Necessary amendments in rules and regulations regarding adoption of MOOC courses would be proposed from time to time.

12. CREDIT TRANSFER POLICY

Adoption of MOOCs is mandatory, to enable Blended model of teaching- learning as also envisaged in the NEP 2020. As per University Grants Commission (Credit Framework for Online Learning Courses through SWAYAM) Regulation, 2016, the University shall allow up to a maximum of 20% of the total courses being offered in a particular programme i.e., maximum of 32 credits through MOOCs platform.

i) The Institution shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.

ii) Student registration for the MOOCs shall be only through the respective department of the institution; it is mandatory for the student to share necessary information with the department.

iii) Credit transfer policy will be applicable to the Professional & Open Elective courses only.

iv) The concerned department shall identify the courses permitted for credit transfer.

v) The University/institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.

vi) The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.

vii) The university shall ensure no overlap of MOOC exams with that of the university examination schedule. In case of delay in results, the university will re-issue the marks sheet for such students.

viii) Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.

ix) The institution shall submit the following to the examination section of the university:

   a) List of students who have passed MOOC courses in the current semester along with the certificate of completion.

   b) Undertaking form filled by the students for credit transfer.

x) The institutions shall resolve any issues that may arise in the implementation of this policy from time to time and shall review its credit transfer policy in the light of periodic changes brought by UGC, SWAYAM, NPTEL and state government.

Note: Students shall be permitted to register for MOOCs offered through online platforms approved by the Institution from time to time.

13. ACADEMIC BANK OF CREDITS (ABC)

The Institution has implemented Academic Bank of Credits (ABC) to promote flexibility in curriculum as per NEP 2020 to

i) Provide option of mobility for learners across the universities of their choice

ii) Provide option to gain the credits through MOOCs from approved digital platforms.

iii) Facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC.

iv) Execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from students' account.

14. MANDATORY INTERNSHIPS SUMMER INTERNSHIPS

Summer Internships: Two summer internships either onsite or virtual each with a minimum of 08 weeks duration, done at the end of second and third years, respectively are mandatory. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power projects, software MNCs or any industries in the areas of concerned specialization of the Undergraduate program. One of the two summer internships at the end of second year (Community Service Project) shall be society oriented and shall be completed in collaboration with government organizations/NGOs & others. The other internship at the end of third year is Industry Internship and shall be completed in collaboration with Industries. The student shall register for the internship as per course structure after commencement of academic year. The guidelines issued by the APSCHE / University shall be followed for carrying out and evaluation of Community Service Project and Industry Internship.

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department.

A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weight age each. It shall be evaluated for 50 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the Institutions.

Full Semester Internship and Project work:

In the final semester, the student should mandatorily register and undergo internship (onsite/virtual) and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship.

The project report shall be evaluated with an external examiner. The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Presentation/Seminar: 15 marks).At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the University and is evaluated for 140 marks.

The institution shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

15. GUIDELINES FOR OFFERING A MINOR

To promote interdisciplinary knowledge among the students, the students admitted into B.Tech. in a major stream/branch are eligible to obtain degree in Minor in another stream.

i) The Minor program requires the completion of 12 credits in Minor stream chosen.

ii) Two courses for 06 credits related to a Minor are to be pursued compulsorily for the minor degree, but maybe waived for students who have done similar/equivalent courses. If waived for a student, then the student must take an extra elective course in its place. It is recommended that students should complete the compulsory courses (or equivalents) before registering for the electives.

iii) Electives (minimum of 2 courses) to complete a total of 12 credits.

Note: A total of 04 Open Electives are offered in the curriculum. A student can complete the requirement for Minor within the 160 credits by opting for the courses offered through various verticals/tracks under Open Electives.

16. GUIDELINES FOR OFFERING HONORS

The objective of introducing B.Tech. (Hons.) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research.

i) Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.

ii) A student shall earn additional 15 credits for award of B.Tech.(Honors) degree from same branch/department/discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 160 credits).

iii) A student is permitted to register for Honors in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to the Honors from V Semester onwards.

iv) The concerned Principal of the college shall arrange separate classwork and timetable of the courses offered under Honors program.

v) Courses that are used to fulfil the student's primary major may not be double counted towards the Honors. Courses with content substantially equivalent to courses in the student's primary Major may not be counted towards the Honors.

vi) Students can complete the courses offered under Honors either in the college or in online platforms like SWAYAM with a minimum duration of 12 weeks for a 3-credit course and 8 weeks duration for a 2-credit course satisfying the criteria for credit mobility. If the courses under Honors are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B. Tech courses.

vii) The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.

viii) A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.

ix) A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors degree program. No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors degree programme.

x) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xi) The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering.

Enrolment into Honors:

i) Students of a Department/Discipline are eligible to opt for Honors program offered by the same Department/Discipline

ii) The enrolment of student into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken up to III semester in case of regular entry students and only III semester in case of lateral entry students. Students having 7 CGPA without any backlog subjects will be permitted to register for Honors.

iii) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.

iv) Transfer of credits from Honors to regular B. Tech degree and vice- versa shall not be permitted.

v) Honors is to be completed simultaneously with a Major degree program.

Registration for Honors:

i) The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Honors.

ii) The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of student pursuing the Honors.
iii) The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.
iv) There is no fee for registration of subjects for Honors program offered in offline at the respective institutions.

17. ATTENDANCE REQUIREMENTS:

i) A student shall be eligible to appear for the University external examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects. b) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee (CAC).
ii) Shortage of Attendance below 65% in aggregate shall in NO CASE be condoned.
iii) A stipulated fee shall be payable towards condonation of shortage of attendance to the Institution.
iv) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
v) A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester from the date of commencement of class work.
vi) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
vii) If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student.
viii) For induction programme attendance shall be maintained as per AICTE norms.

18. PROMOTION RULES:

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in section 16.

i) A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per university norms.
ii) A student will be promoted from II to III year if he/she fulfils the academic requirement of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) up to in the subjects that have been studied up to III semester.
iii) A student shall be promoted from III year to IV year if he/she fulfils the academic

requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.

iv) And in case a student is detained for want of credits for a particular academic year by ii) & iii) above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be.

v) When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

19. GRADING:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:
After each course is evaluated for 100 marks, the marks obtained in each course will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

(a) Structure of Grading of Academic Performance

Range in which the marks in the subject fall	Grade	Grade points Assigned
90 & above	Superior	10
80 - 89	A (Excellent)	9
70 - 79	B (Very Good)	8
60 - 69	C (Good)	7
50 - 59	D (Average)	6
40 - 49	E (Pass)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

i) A student obtaining Grade 'F' or Grade 'Ab' in a subject shall be considered failed and will be required to reappear for that subject when it is offered the next supplementary examination.

ii) For non-credit audit courses, "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA/Percentage.

iii) Computation of Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

iv) The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \Sigma (C_i \times G_i)/\Sigma C_i$$

where, C_i is the number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course.

The Cumulative Grade Point Average (CGPA) will be computed in the same manner considering all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \Sigma (C_i \times S_i)/ \Sigma C_i$$

where "S_i" is the SGPA of the i^{th} semester and C_i is the total number of credits up to that semester.

Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by the letters S, A, B, C, D and F.

(b) Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following four classes:

Class Awarded	CGPA Secured
First Class with Distinction	≥ 7.5 (Without any Supplementary Appearance)
First Class	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 5.0 < 5.5

Note: * Students who have written supplementary examinations to fulfil the credit requirement will not be awarded First Class with Distinction. For such students the highest degree that is awarded will be First Class Only.

CGPA to Percentage conversion Formula – (CGPA – 0.5) x 10

20. WITH–HOLDING OF RESULTS

If the candidate has any dues not paid to the institution or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases.

21. MULTIPLE ENTRY / EXIT OPTION

(a) Exit Policy:

The students can choose to exit the four-year programme at the end of first/second/third year.

i) **UG Certificate in (Field of study/discipline)** - Programme duration: First year (first two semesters) of the undergraduate programme, 40credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6- credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

ii) **UG Diploma (in Field of study/discipline)** - Programme duration: First two years (first four semesters) of the undergraduate programme, 80 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6- credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce.

iii) **Bachelor of Science (in Field of study/discipline)** i.e., **B.Sc. Engineering in (Field of study/discipline)**- Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits.

(b) Entry Policy:

Modalities on multiple entry by the student into the B.Tech. programme will be provided in due course of time.

Note: The Universities / Institution shall resolve any issues that may arise in the implementation of Multiple Entry and Exit policies from time to time and shall review the policies in the light of periodic changes brought by UGC, AICTE and State government.

22. GAP YEAR CONCEPT:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship / become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship programme/to establish startups. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. The principal of the respective college shall forward such proposals submitted by the students to the University.

An evaluation committee constituted by the University shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not.

23. TRANSITORY REGULATIONS

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B. Tech from the date of commencement of class work, subject to Section 2 and they will follow the academic regulations into which they are readmitted.

24. MINIMUM INSTRUCTION DAYS FOR A SEMESTER:

The minimum instruction days including exams for each semester shall be 90 days.

25. MEDIUM OF INSTRUCTION

The medium of instruction of the entire B. Tech undergraduate programme in Engineering &Technology (including examinations and project reports) will be in English only.

26. STUDENT TRANSFERS:

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the Universities from time to time.

27. GENERAL INSTRUCTIONS:

a) The academic regulations should be read as a whole for purpose of any interpretation.
b) Malpractices rules-nature and punishments are appended.
c) Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
d) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Head of the Institution is final.
e) The Institution may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities.
f) In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Head of the institution is final.

Academic Regulations (R23) for B. Tech (Lateral Entry Scheme)

(Effective for the students getting admitted into II year through Lateral Entry Scheme from the Academic Year 2024-2025 onwards)

1. AWARD OF THE DEGREE

(a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils the following:

(i) Pursues a course of study for not less than three academic years and not more than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years).

(ii) Registers for 120 credits and secures all 120 credits.

(b) Award of B.Tech. degree with Honors

A student will be declared eligible for the award of the B.Tech. with Honors if he/she fulfils the following:

(i) Student secures additional 15 credits fulfilling all the requisites of a B.Tech. program i.e., 120 credits.

(ii) Registering for Honors is optional.

(iii) Honors are to be completed simultaneously with B. Tech.programme.

2. Students, who fail to fulfil the requirement for the award of the degree within six consecutive academic years from the year of admission, shall forfeit their seat.

3. MINIMUM ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied in addition to the requirements mentioned in item no.2

(i) A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester evaluation and end examination taken together.

(ii) A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester.

(iii) And in case if student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

4. COURSE PATTERN

(i) The entire course of study is three academic years on semester pattern.

(ii) A student eligible to appear for the end examination in a subject but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered.

(iii) When a student is detained due to lack of credits/shortage of attendance the student may be re-admitted when the semester is offered after fulfilment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted.

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

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B. Tech R23 - COURSE STRUCTURE AND SYLLABI

Semester I (First Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23HSM111T	Communicative English	2	0	0	2	30	70	100
2	23BSC114T	Linear Algebra and Calculus	2	1	0	3	30	70	100
3	23ESC112T	Basic Electrical and Electronics Engineering	2	1	0	3	30	70	100
4	23ESC113T	Engineering Graphics	1	0	4	3	30	70	100
5	23ESC114T	Introduction to Programming	2	1	0	3	30	70	100
6	23HSM112L	Communicative English Lab	0	0	2	1	30	70	100
7	23ESC118L	IT Workshop	0	0	2	1	30	70	100
8	23ESC115L	Computer Programming Lab	0	0	3	1.5	30	70	100
9	23ESC116L	Electrical and Electronics Engineering Workshop	0	0	3	1.5	30	70	100
10	23HSM114L	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5	-	-	100
Contact Hours per week			9	3	15	-	-	-	-
Total Hours per week			27			-	-	-	-
Total credits						19.5	-	-	-
Total Marks							270	630	1000

Semester II (First Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23BSC121T	Differential Equations and Vector Calculus	2	1	0	3	30	70	100
2	23BSC111T	Applied Chemistry	2	1	0	3	30	70	100
3	23BSC113T	Engineering Physics	2	1	0	3	30	70	100
4	23ESC111T	Basic Civil and Mechanical Engineering	2	1	0	3	30	70	100
5	23EEE121T	Electrical Circuit Analysis	2	1	0	3	30	70	100
6	23BSC115L	Applied Chemistry Lab	0	0	2	1	30	70	100
7	23BSC117L	Engineering Physics Lab	0	0	2	1	30	70	100
8	23ESC117L	Engineering Workshop	0	0	3	1.5	30	70	100
9	23EEE122L	Electrical Circuits Lab	0	0	3	1.5	30	70	100
10	23HSM113L	Health and wellness, Yoga and Sports	0	0	1	0.5	-	-	100
Contact Hours per week			10	5	11	-	-	-	-
Total Hours per week			26			-	-	-	-
Total credits						20.5	-	-	-
Total Marks							270	630	1000

Semester III (Second Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23BSC231T	Complex Variables and Numerical Methods	2	1	-	3	30	70	100
2	23ESC231T	Analog Circuits	2	1	-	3	30	70	100
3	23EEE231T	DC Machines and Transformers	2	1	-	3	30	70	100
4	23EEE232T	Electromagnetic Field Theory	2	1	-	3	30	70	100
5	23EEE233T	Network Theory	2	1	-	3	30	70	100
6	23EEE234L	DC Machines and Transformers Lab	-	-	3	1.5	30	70	100
7	23EEE235L	Network Theory and Simulation Lab	-	-	3	1.5	30	70	100
8	23CSE235L	Python Programming (Skill Enhancement Course)	-	1	2	2	30	70	100
9	23MAC231U	Environmental Science	2	-	-	-	30	-	P
Contact Hours per week			12	06	08	-	-	-	-
Total Hours per week						-	-	-	-
Total credits						20	-	-	-
Total Marks							270	560	800

Semester IV (Second Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23HSM231A 23HSM231B 23HSM231C	Business Environment / Managerial Economics and Financial Analysis / Organizational Behavior	2	-	-	2	30	70	100
2	23HSM234T	Universal Human Values – Understanding Harmony and Ethical Human Conduct	2	1	-	3	30	70	100
3	23EEE241T	Control Systems	2	1	-	3	30	70	100
4	23EEE242T	Induction and Synchronous Machines	2	1	-	3	30	70	100
5	23EEE243T	Power Systems – I	2	1	-	3	30	70	100
6	23EEE244L	Control Systems Lab	-	-	3	1.5	30	70	100
7	23EEE245L	Induction and Synchronous Machines Lab	-	-	3	1.5	30	70	100
8	23CSE244L	Data Structures and Algorithm (Skill Enhancement Course)	-	1	2	2	30	70	100
9	23ESC241I	Design Thinking and Innovation	1	-	2	2	30	70	100
Contact Hours per week			11	5	10	-	-	-	-
Total Hours per week						-	-	-	-
Total credits						21	-	-	-
Total Marks							270	630	900
Mandatory Community Service Project Internship of 06-08 weeks duration during summer Vacation									

Semester V (Third Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23ECE353T	Digital Circuits	2	1	-	3	30	70	100
2	23EEE351T	Power Electronics	2	1	-	3	30	70	100
3	23EEE352T	Power Systems-II	2	1	-	3	30	70	100
4	PE-I	Professional Elective – I	3	-	-	3	30	70	100
5	OE-I	Open Elective – I	3	-	-	3	30	70	100
6	23ESC351T	Introduction to Quantum Technology and Applications	3	-	-	3	30	70	100
7	23ECE357L	Analog and Digital Circuits Lab	-	-	3	1.5	30	70	100
8	23EEE354L	Power Electronics Lab	-	-	3	1.5	30	70	100
9	23HSM241L	Soft Skills (Skill Enhancement Course)	-	1	2	2	30	70	100
10	23ESC352L	Tinkering Lab	-	-	2	1	30	70	100
11	23EEE351P	Evaluation of Community Service Project	-	-	-	2	-	100	100
Contact Hours per week			15	04	10	-	-	-	-
Total Hours per week			29			-	-	-	-
Total credits						26	-	-	-
Total Marks							300	800	1100

Semester VI (Third Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23ECE354T	Microprocessors and Microcontrollers	2	1	-	3	30	70	100
2	23EEE361T	Electrical Measurements and Instrumentation	2	1	-	3	30	70	100
3	23EEE362T	Power System Analysis	2	1	-	3	30	70	100
4	PE-II	Professional Elective – II	3	-	-	3	30	70	100
5	PE-III	Professional Elective – III	3	-	-	3	30	70	100
6	OE-II	Open Elective – II	3	-	-	3	30	70	100
7	23ECE358L	Microprocessors and Microcontrollers Lab	-	-	3	1.5	30	70	100
8	23EEE366L	Electrical Measurements and Instrumentation Lab	-	-	3	1.5	30	70	100
9	23EEE365L	Applications of Soft Computing Tools in Electrical Engineering (Skill Enhancement Course)	-	1	2	2	30	70	100
10	23MAC351U	Technical Paper Writing & IPR	2	-	-	-	30	-	P
11	23EEE361P	Domain Specific Workshop	-	-	-	-	50	-	-
Contact Hours per week			17	04	08	-	-	-	-
Total Hours per week			29			-	-	-	-
Total credits						23	-	-	-
Total Marks							350	630	900

B. Tech R23 - COURSE STRUCTURE AND SYLLABI

Semester VII (Fourth Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23EEE471T	Power System Operation and Control	2	1	-	3	30	70	100
2	ME	Management Elective	2	-	-	2	30	70	100
3	PE-IV	Professional Elective – IV	3	-	-	3	30	70	100
4	PE-V	Professional Elective – V	3	-	-	3	30	70	100
5	OE-III	Open Elective – III	3	-	-	3	30	70	100
6	OE-IV	Open Elective – IV	3	-	-	3	30	70	100
7	23EEE474L	Power Systems and Simulation Lab (Skill Enhancement Course)	-	1	2	2	30	70	100
8	23EEE471P	Evaluation Industry Internship	-	-	-	2	-	100	100
9	23MAC471U	Gender Sensitization	2	-	-	-	30	-	P
Contact Hours per week			18	02	02	-	-	-	-
Total Hours per week			22			-	-	-	-
Total credits						21	-	-	-
Total Marks							240	590	800

Semester VIII (Fourth Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23EEE481P	Internship	-	-	24	4	-	100	100
2	23EEE482P	Project Work	-	-	-	8	30	70	100
Contact Hours per week			-	-	24	12	-	-	-
Total Hours per week			24			-	-	-	-
Total credits						12	-	-	-
Total Marks							30	170	200

Note:

1. *A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.*
2. *A student shall not be permitted to take courses as Open Electives / Minor / Honours with content substantially equivalent to the courses pursued in the student's primary major.*
3. *Minor & Honour tracks shall be offered for 18 credits over and above 163 Credits 05 theory courses of 3 credits each, practical courses of 1.5 credits each or project for 3 credits for Minors and Honours.*
4. *A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline.*
5. ***One Industry Visit** is Mandatory either in 3rd or 4th year*
6. *Student will undergo **ONE WEEK WORKSHOP** (domain specific) after the end of the FIFTH semester examination and it will be reflected in SIXTH semester for zero credits.*
7. ***One Expert Lecturer** in every semester (domain Specific) is mandatory.*

Professional Elective – I - Semester V (Third Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23ECE355E	Signals and Systems	3	-	-	3	30	70	100
2	23EEE353A	Electrical Safety and Risk Management	3	-	-	3	30	70	100
3	23EEE353B	Digital Control Systems	3	-	-	3	30	70	100
4	23EEE353C	Utilization of Electrical Energy	3	-	-	3	30	70	100

Professional Elective – II - Semester VI (Third Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23EEE363A	AI&ML for Electrical Engineering	3	-	-	3	30	70	100
2	23EEE363C	Programmable Logic Controllers	3	-	-	3	30	70	100
3	23EEE363D	Switchgear and Protection	3	-	-	3	30	70	100
4	23EEE363E	System Theory	3	-	-	3	30	70	100

Professional Elective – III - Semester VI (Third Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23EEE364A	Electric Drives	3	-	-	3	30	70	100
2	23EEE364B	Power System Dynamics	3	-	-	3	30	70	100
3	23EEE364C	Renewable and Distributed Energy Technologies	3	-	-	3	30	70	100
4	23ECE365A	Communication Systems	3	-	-	3	30	70	100

Professional Elective – IV - Semester VII (Fourth Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23EEE472A	Electric Vehicle Technology	3	-	-	3	30	70	100
2	23EEE472B	HVDC & FACTS	3	-	-	3	30	70	100
3	23EEE472C	Power System Transient	3	-	-	3	30	70	100
4	23ECE472B	Digital Signal Processing	3	-	-	3	30	70	100

Professional Elective – V - Semester VII (Fourth Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23EEE473A	Electrical Distribution System	3	-	-	3	30	70	100
2	23EEE473B	Modern Control Theory	3	-	-	3	30	70	100
3	23EEE473C	Switched Mode Power Conversion	3	-	-	3	30	70	100
4	23EEE473D	Special Electrical Machines	3	-	-	3	30	70	100

Management Science Elective – Semester VII (Fourth Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23HSM471A	Business Ethics and Corporate Governance	3	-	-	3	30	70	100
2	23HSM471B	E-Business	3	-	-	3	30	70	100
3	23HSM471C	Management Science	3	-	-	3	30	70	100

Open Elective – I - Semester V (Third Year)

S.No	Course Code	Offered Department	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P	C	I	E	Total
1	23OCE351A	CE	Green Buildings	3	-	-	3	30	70	100
2	23OCE351B		Construction Technology and Management	3	-	-	3	30	70	100
3	23OEC351A	ECE	Electronic Circuits	3	-	-	3	30	70	100
4	23OCS351A	CSE & Allied	Java Programming	3	-	-	3	30	70	100
5	23OAI351A		Fundamentals of Artificial Intelligence	3	-	-	3	30	70	100
6	23OME351A	ME	Sustainable Energy Technologies	3	-	-	3	30	70	100
7	23OSH351A	Mathematics	Mathematics for Machine Learning and AI	3	-	-	3	30	70	100
8	23OSH351B	Physics	Materials Characterization Techniques	3	-	-	3	30	70	100
9	23OSH351C	Chemistry	Chemistry of Energy Systems	3	-	-	3	30	70	100
10	23OSH351D	Humanities	English for Competitive Examinations	3	-	-	3	30	70	100
11	23OSH351E		Entrepreneurship and New Venture Creation	3	-	-	3	30	70	100

Open Elective – II - Semester VI (Third Year)

S.No	Course Code	Offered Department	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P	C	I	E	Total
1	23OCE361A	CE	Disaster Management	3	-	-	3	30	70	100
2	23OCE361B		Sustainability In Engineering Practices	3	-	-	3	30	70	100
3	23OEC361A	ECE	Digital Electronics	3	-	-	3	30	70	100
4	23OCS361A	CSE & Allied	Principles of Operating Systems	3	-	-	3	30	70	100
5	23OML361A		Introduction to Machine Learning	3	-	-	3	30	70	100
6	23OME361A	ME	Principles of Automation and Robotics	3	-	-	3	30	70	100
7	23OSH361A	Mathematics	Optimization Techniques for Engineers	3	-	-	3	30	70	100
8	23OSH361B		Mathematical Foundation Of Quantum Technologies	3	-	-	3	30	70	100
9	23OSH361C	Physics	Physics of Electronic Materials And Devices	3	-	-	3	30	70	100
10	23OSH361D	Chemistry	Chemistry of Polymers and Applications	3	-	-	3	30	70	100
11	23OSH361E	Humanities	Academic Writing and Public Speaking	3	-	-	3	30	70	100

Open Elective – III - Semester VII (Fourth Year)

S.No	Course Code	Offered Department	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P	C	I	E	Total
1	23OCE471A	CE	Building Materials and Services	3	-	-	3	30	70	100
2	23OCE471B		Environmental Impact Assessment	3	-	-	3	30	70	100
3	23OEC471A	ECE	Fundamentals of Microprocessors and Controllers	3	-	-	3	30	70	100
4	23OCS471A	CSE & Allied	Fundamentals of Database Systems	3	-	-	3	30	70	100
5	23OCS471B		Fundamentals of Cyber Security	3	-	-	3	30	70	100
6	23OME471A	ME	3D Printing Technologies	3	-	-	3	30	70	100
7	23OSH471A	Mathematics	Wavelet transforms and its Applications	3	-	-	3	30	70	100
8	23OSH471B	Physics	Smart Materials and Devices	3	-	-	3	30	70	100
9	23OSH471C		Introduction to Quantum Mechanics	3	-	-	3	30	70	100
10	23OSH471D	Chemistry	Green Chemistry and Catalysis for Sustainable Environment	3	-	-	3	30	70	100
11	23OSH471E	Humanities	Employability Skills	3	-	-	3	30	70	100

Open Elective – IV - Semester VII (Fourth Year)

S.No	Course Code	Offered Department	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P	C	I	E	Total
1	23OCE472A	CE	Geo-Spatial Technologies	3	-	-	3	30	70	100
2	23OCE472B		Solid Waste Management	3	-	-	3	30	70	100
3	23OEC472A	ECE	Transducers and Sensors	3	-	-	3	30	70	100
4	23OCS472A	CSE & Allied	Computer Networks	3	-	-	3	30	70	100
5	23OCS472B		IoT Concepts and Applications	3	-	-	3	30	70	100
6	23OME472A	ME	Fundamentals of Quality Management	3	-	-	3	30	70	100
7	23OSH472A	Mathematics	Financial Mathematics	3	-	-	3	30	70	100
8	23OSH472B	Physics	Sensors And Actuators For Engineering Applications	3	-	-	3	30	70	100
9	23OSH472C	Chemistry	Chemistry Of Nanomaterial's and Applications	3	-	-	3	30	70	100
10	23OSH472D	Humanities	Literary Vibes	3	-	-	3	30	70	100
11	23OPEN472	OPEN	Introduction to Quantum Computing	3	-	-	3	30	70	100

S.No	Subject Area	Credit Mapping								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	HSMC	3.5	0.5	3	2	-	-	2	-	11
2	BSC	3	11	3	-	-	-	-	-	17
3	ESC	13	4.5	-	5	4	-	-	-	26.5
4	PCC	-	4.5	12	12	12	12	3	-	55.5
5	SEC	-	-	2	2	2	2	2	-	10
6	PEC	-	-	-	-	3	6	6	-	15
7	OEC	-	-	-	-	3	3	6	-	12
8	PWC	-	-	-	-	2	-	2	12	16
9	AC	-	-	Y	-	-	Y	Y	-	--
TOTAL		19.5	20.5	20	21	26	23	21	12	163

NOTE: ***HSMC*** *– Humanities, Social Science and Management Science Courses;* ***BSC*** *– Basic Science Courses;* ***ESC*** *– Engineering Science Courses;* ***PCC*** *– Professional Core Courses;* ***SEC*** *– Skill Enhancement Course;* ***PEC*** *– Professional Elective Courses;* ***OEC*** *– Open Elective Courses;* ***PWC*** *– Project Work Courses &* ***AC*** *– Audit Courses*

23HSM111T	COMMUNICATIVE ENGLISH (Common to All Branches of Engineering)	L	T	P	C
		2	0	0	2

COURSE EDUCATIONAL OBJECTIVES

The main objective of introducing this course, communicative English, is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

UNIT-I: HUMAN VALUES-Gift of Magi (Short Story)

Listening	Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions
Speaking	Asking and answering general questions on familiar to pics such as home, family, work, studies and interests; introducing one self and others.
Reading	Skimming to get the main idea of a text; scanning to look for specific pieces of information.
Writing	Mechanics of Writing-Capitalization, Spelling Punctuation– Parts of Sentences.
Grammar	Parts of Speech, Basic Sentence Structures - forming questions
Vocabulary	Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words

UNIT-II: NATURE-The Brook by Alfred Tennyson (Poem)

Listening	Answering a series of questions about main ideas and supporting ideas after listening to audiotexts.
Speaking	Discussion in pairs/small groups on specific topics followed by short structure talks.
Reading	Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together
Writing	Structure of a paragraph - Paragraph writing (specific topics)
Grammar	Cohesive devices-linkers, use of articles and zero article; prepositions
Vocabulary	Homonyms, Homophones, Homographs

UNIT-III: BIOGRAPHY-Elon Musk

Listening:	Listening for global comprehension and summarizing what is listened to.
Speaking:	Discussing specific to pics in pairs or small groups and reporting what is discussed
Reading:	Reading at extendedly making basic inferences-recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing:	Summarizing, Note-making, paraphrasing
Grammar:	Verbs-tenses; subject-verb agreement; Compound words, Collocations
Vocabulary:	Compound words, Collocations

UNIT-IV: INSPIRATION-The Toys of Peace by Saki

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) –asking for and giving information/directions.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

Writing: Letter Writing: Official Letters, Resumes

Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice

Vocabulary: Words often confused, Jargons

UNIT-V: MOTIVATION-The Power of Intrapersonal Communication (An Essay)

Listening: Identifying key terms, understanding concepts and answering series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts

Reading: Reading comprehension.

Writing: Writing structure dessayson specific topics.

Grammar: Editing short texts–identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Vocabulary: Technical Jargons

COURSE OUTCOMES:

On successful completion of the course the student will enable to		POs related to COs
CO1	Understand the context, topic, and pieces of specific information from social or transactional dialogues.	**PO1**
CO2	Apply grammatical structures to formulate sentences and correct wordforms.	**PO5**
CO3	Analyzed is course markers to speak clearly on a specific topic in informal discussions	**PO2**
CO4	Evaluate reading/listening texts and To write summaries Based On global comprehension of these texts.	**PO6**
CO5	Create a coherent paragraph, essay, and resume.	**PO4**

TEXT BOOKS:

1. Pathfinder: Communicative English for Undergraduate Students,1st Edition, Orient Black Swan, 2023
2. Empowering with Language byCengagePublications,2023

REFERENCE BOOKS:

1. Dubey, ShamJi&Co. English for Engineers, VikasPublishers,2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students.Routledge,2014
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, CambridgeUniversityPress,2019.
4. Lewis, Norman. Word Power Made Easy-
5. The Complete Handbook for Building a Superior Vocabulary.Anchor,2014.

REFERENCE WEBSITES:

GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

CO-PO MAPPING:

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

23BSC114T	LINEAR ALGEBRA & CALCULUS (Common to All Branches of Engineering)	L	T	P	C
		2	1	-	3

COURSE EDUCATIONAL OBJECTIVES:

1. To familiarize the concepts of matrices and mean value theorems and their applications in engineering.
2. To equip the students to solve various application problems in engineering through evaluation of multiple integrals etc.,
3. To equip the students with standard concepts and tools of mathematics to handle various real-world problems and their applications.

UNIT-I: MATRICES (9)

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method. Iterative methods: Jacobi and Gauss Seidel Methods.

UNIT-II: EIGEN VALUES, EIGEN VECTORS AND ORTHOGONAL TRANSFORMATION (9)

Eigen values, Eigenvectors and their properties, Diagonalization of a matrix, Cayley- Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley- Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III: CALCULUS (9)

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin's theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT-IV: PARTIAL DIFFERENTIATION AND APPLICATIONS (MULTI VARIABLE CALCULUS) (9)

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of twovariables, method of Lagrange multipliers.

UNIT-V: MULTIPLE INTEGRALS (MULTIPLE VARIABLE CALCULUS) (9)

Double integrals, Triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	To solve a system of homogenous and non-homogeneous linear equations	**PO1, PO2, PO3**
CO2	Develop and use of matrix algebra techniques that are needed by engineers for practical applications	**PO1, PO2, PO3**
CO3	Learn important tools of calculus in higher dimensions. Utilize mean value theorems to real life problems.	**PO1, PO2, PO3**
CO4	Familiarize with functions of several variables which is useful in optimization	**PO1, PO2, PO3**
CO5	Familiarize with double and triple integrals of functions of several variables in two dimensions using Cartesian and polar coordinates and in three dimensions using cylindrical and spherical coordinates.	**PO1, PO2, PO3**

TEXT BOOKS:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44thEdition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

REFERENCE BOOKS:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition(9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, Pearson publishers, 9th edition
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications,2014, Third Edition (Reprint 2021)

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/110/105/111105111/
2. https://www.youtube.com/watch?v=8D3WViAyJvc
3. https://www.youtube.com/watch?v=fKzDtjq0ks4
4. https://www.youtube.com/watch?v=wMd4YRyBmjA
5. https://www.youtube.com/watch?v=ArkDa6d5h9I

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	2	-	-	-	-	-	-	-	-	-
CO.2	3	3	2	-	-	-	-	-	-	-	-	-
CO.3	3	3	2	-	-	-	-	-	-	-	-	-
CO.4	3	3	2	-	-	-	-	-	-	-	-	-
CO.5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	3	3	2	-	-	-	-	-	-	-	-	-

23ESC112T	BASIC ELECTRICAL & ELECTRONICS ENGINEERING (Common to All branches of Engineering) PART A: BASIC ELECTRICAL ENGINEERING	L	T	P	C
		2	1	0	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. Apply fundamental circuit theories to both DC and AC circuits, and analyze the complex circuit configurations.
2. Gain proficiency in understanding, operating, and analyzing electrical machines and their applications in various industries and understanding the concept of measuring instruments
3. Gain knowledge about various energy resources and understand the concept of electrical energy consumption, billing mechanism, and safety measures.

UNIT-1: DC & AC CIRCUITS:

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase and phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT-2: MACHINES AND MEASURING INSTRUMENTS:

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor (v) Alternator, Applications of electrical machines.
Measuring Instruments: Construction and working principle of Moving Coil and Moving Iron Instruments, Dynamometer Wattmeter, Energy meter and Wheat Stone bridge.

UNIT-3: ENERGY RESOURCES, ELECTRICITY BILL & SAFETY MEASURES:

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Thermal, Nuclear, Solar & Wind powergeneration.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

COURSE OUTCOMES:

On successful completion of the course the student could be		POs related to COs
CO1	Demonstrate the ability to analyze and solve complex DC and AC circuits, and analyze the complex circuit configurations.	PO1, PO2, PO3,
CO2	Comprehend the construction, principles, and operation of DC and AC machines, and analyze the working principles of various measuring instruments	PO1, PO2, PO3,

CO3	Evaluate different energy resources and Calculate electricity bills and understand the importance of safety measures.	PO1, PO2, PO3,

TEXTBOOKS:

1. D. C. Kulshreshtha, Basic Electrical Engineering, Tata McGraw Hill, 2019, First Edition

2. P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, Power System Engineering, 2013

3. Rajendra Prasad, Fundamentals of Electrical Engineering, PHI publishers, 2014, Third Edition

REFERENCE BOOKS:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Mc Graw Hill, 2019, Fourth Edition 2. V.K. Mehtha, S.Chand Technical Publishers, "Principles of Power Systems", 2020

3.M.S.Naidu,S.kamakshiah"Basic Electrical Engineering", Mc Graw Hill, 2019, Fourth Edition

4.T.K.Nagsarkar,M.S.Sukilja "Basic Electrical Engineering", Oxford Higher education.

WEB RESOURCES: https://nptel.ac.in/courses/108105053
https://nptel.ac.in/courses/108108076

CO-PO MAPPING:

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

PART B: BASIC ELECTRONICS ENGINEERING

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. Gain the knowledge on basic semiconductor devices
2. Acquire the knowledge on electronic circuits and instrumentation.
3. Understand the principles of digital electronics, combinational circuits and sequential circuits

UNIT-1: SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT-2: BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT-3: DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

COURSE OUTCOMES:

On successful completion of the course the student could be		POs related to COs
CO1	Understand the concept and working of diodes, transistors, and their applications.	PO1, PO2, PO3, PO12
CO2	Analyze the electronic circuits and instrumentation	PO1, PO2, PO3, PO12
CO3	Familiarize with the number systems, codes, Boolean algebra and logic gates and understand the working of different combinational & sequential circuits.	PO1, PO2, PO3, PO12

TEXTBOOKS:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, PearsonEducation, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

REFERENCE BOOKS:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall,India, 2002.
3. S. Salivahanan, N. Suresh Kumar, Electronic Devices & Circuits, third edition.

Web Resources:

https://archive.nptel.ac.in/courses/108/101/108101091/

https://archive.nptel.ac.in/courses/117/103/117103063/

https://archive.nptel.ac.in/courses/117/107/117107095/

https://archive.nptel.ac.in/courses/122/106/122106025/

https://archive.nptel.ac.in/courses/122/106/122106026/

CO-PO MAPPING:

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

23ESC113T	ENGINEERING GRAPHICS (Common to All Branches)	L T P C 1 0 4 3

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. To expose them to national standards related to technical drawings and develop knowledge of basic engineering curves.
2. To develop drawing skills for communication of concepts, ideas and design of projections of points, lines and planes.
3. To develop geometrical shapes and multiple views of projections of solids.
4. To develop drawing skills for communication of concepts, ideas and design the development of surfaces of section of solids.
5. To develop geometrical shapes and multiple views of orthographic projections of isometric views.

UNIT –1: ENGINEERING CURVES AND SCALES (9)

Introduction: Introduction about lines, lettering and dimensioning – Geometrical constructions and constructing regular polygons by general methods. **Engineering Curves:** Construction of ellipse, parabola and hyperbola by general method – Construction of cycloids – Construction involutes – Drawing of tangents and normal to the above curves. **Scales:** Plain scales, and diagonal.

UNIT –2: PROJECTION OF POINTS, LINES AND PLANE SURFACES (12)

Projection of Points: Principles of orthographic projection – Reference lines and Plane – Projections of points. **Projection of Lines:** Projections of lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane – Determination of true lengths, true inclinations by rotating line and trapezoidal method. **Projection of Planes:** Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

UNIT –3: PROJECTION OF SOLIDS (12)

Projection of Solids: Types of solids – Projection of simple solids (prisms, pyramids, cylinder and cone) – Axis perpendicular to horizontal plane, axis perpendicular to vertical plane and axis parallel to both the reference planes, projection of solids with axis inclined to one reference plane and parallel to another plane.

UNIT –4: SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES (12)

Section of Solids: Sectioning of right regular solids like prisms, pyramids, cylinder and cone – Solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other plane – Obtaining true shape of section. **Development of Surfaces:** Development of Surfaces: Development of lateral surfaces of simple and sectioned solids like prisms, pyramids, cylinder and cone.

UNIT –5: ISOMETRIC PROJECTIONS AND ORTHOGRAPHIC PROJECTIONS (9)

Isometric Projection: Principles of isometric projection – Isometric scale – Isometric views of simple solids and truncated solids like prisms, pyramids, cylinder, sphere, and cone.

Orthographic Projections: Visualization principles – Plane of projections – Representation of three-dimensional objects – Sketching of multiple views from pictorial views – Conversion of isometric views to orthographic views – Conversion of orthographic views to isometric views.

COMPUTER GRAPHICS (Not for Examination) **(3)**
Practicing of simple 2D and 3D drawings of objects using Auto CAD

Total Hours: 60

COURSE OUTCOMES:

On successful completion of the course, students will beable to		POs related to COs
CO1	Construct the Engineering curves and generate tangent and normal for those curves.	**PO1, PO2, P03,P10, PO12**
CO2	Draw the projection of points, lines and plane surfaces.	**PO1, PO2, P03,P10, PO12**
CO3	Draw the projection of solids, like prisms, pyramids, cylinder, and cone.	**PO1, PO2, P03,P10, PO12**
CO4	Draw the section of solids and development of surfaces.	**PO1, PO2, P03,P10, PO12**
CO5	Draw the isometric projections and orthographic views.	**PO1, PO2, P03,P10, PO12**

TEXT BOOKS:

1. N.D. Bhatt and V. M. Panchal, "Engineering Drawing", Charotar Publishing House, 50th edition, 2010.
2. M.B.Shah and B.C.Rana , "Engineering Drawing", Pearson Education, 2/e, 2009.

REFERENCE BOOKS:

3. K.L.Narayana and P.Kannaiah, "Engineering Drawing", 2/e, 2012, Scitech Publishers.
4. Luzzader, Warren.J and Duff,John M, "Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. K.Venugopal and V.Prabhu Raja, "Engineering Graphics", New Age International (P) Limited, 2008.
6. Basant Agarwal and C.M.Agarwal," Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, , 2008,
7. K.V.Natrajan , "A Text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai. 2009.
8. Creating 2D&3D drawings of objects including PCB and Transformations using AutoCAD

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112/102/112102304/
2. https://nptel.ac.in/courses/112/105/112105294/
3. https://nptel.ac.in/courses/112/103/112103019/
4. https://nptel.ac.in/courses/112/104/112104172/

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	3	-	-	-	-	-	-	1	-	1
CO.2	3	2	3	-	-	-	-	-	-	1	-	1
CO.3	3	2	3	-	-	-	-	-	-	1	-	1
CO.4	3	2	3	-	-	-	-	-	-	1	-	1
CO.5	3	2	3	-	-	-	-	-	-	1	-	1
CO*	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**1**	**-**	**1**

23ESC114T	INTRODUCTION TO PROGRAMMING (Common to all Branches)	L T P C
		2 1 0 3

COURSE EDUCATIONAL OBJECTIVES:

1. To introduce students to the fundamentals of computer programming.
2. To provide logical thinking and problem-solving skills using control structures.
3. To familiarize students with programming concepts such as data types, arrays and strings.
4. To introduce the concepts of pointers and user-define data types.
5. To encourage the students with functions and file handling mechanisms.

UNIT- 1 INTRODUCTION TO PROGRAMMING AND PROBLEM SOLVING (10)

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operators and Expressions, Type Conversion, and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT- 2 CONTROL STRUCTURES (8)

Simple sequential programs, Conditional Statements (if, if-else, switch), Loops (for, while, do-while). Break and Continue.

UNIT- 3 ARRAYS AND STRINGS (9)

Arrays indexing, memory model, programs with array of integers, two dimensional arrays. Strings-Declaring and Initializing String Variables, Reading string from terminal, Writing string to the screen, String Handling Functions.

UNIT-4 POINTERS & USER DEFINED DATA TYPES (9)

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers. User-defined data types-Structures and Unions.

UNIT-5 FUNCTIONS & FILE HANDLING (9)

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables. File Handling- Basic Operations on Files – File Handling Function.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course the student will be able to,		POs related to COs
CO1	Understand basics of computers, the concept of algorithm and algorithmic thinking.	**PO1, PO2**
CO2	Analyze a problem and develop an algorithm and program using control structures to solve it.	**PO1, PO2, PO3**
CO3	Implement various programming concepts using arrays and strings.	**PO1,PO2, PO3, PO4**
CO4	Understand and implement more advanced features of pointers and user-defined data types.	**PO1, PO2, PO5**
CO5	Develop problem-solving using functions and file handling concepts.	**PO1, PO3, PO4, PO5**

TEXT BOOKS:
1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice- Hall,1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education,1996

REFERENCE BOOKS:
1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education,2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE,3rd edition

REFERENCE WEBSITES:
1. https://onlinecourses.swayam2.ac.in/cec22_cs11
2. https://onlinecourses.nptel.ac.in/noc22_cs40
3. https://www.geeksforgeeks.org

CO-PO MAPPING:

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

23HSM112L	COMMUNICATIVE ENGLISH LAB (Common to all Branches of Engineering)	L	T	P	C
		-	-	2	1

COURSE EDUCATIONAL OBJECTIVES:

The main objective of introducing this course, *Communicative English Laboratory*, is to expose the students to a variety of self-instructional, learner friendly modes of language learning students will get trained in the basic communication skills and make them ready to face job interviews.

LIST OF TOPICS:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play, Conversational Practice and TED talks
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates-Methods & Practice
9. PPT Presentations/Poster Presentation
10. Interviews Skills

SUGGESTED SOFTWARES:

1. Walden Info tech
2. Young India Films

REEFERENCE BOOKS:

1. Meenakshi Raman, Sangeeta-Sharma. Technical Communication.OxfordPress.2018.
2. GrantTaylor: English Conversation Practice, TataMcGraw-HillEducationIndia,2016
3. Hewing's, Martin. Cambridge Academic English(B2). CUP,2012.
4. T. Balasubramanyam, A Textbook of English Phonetics for Indian Students, (3rdEd) Trinity Press.

WEB RESOURCES:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

COURSE OUTCOMES:

On successful completion of the course the student will be enable to		POs related to COs
CO1	Understand the different aspects of the English language proficiency with emphasis on LSRW skills.	PO1
CO2	Apply communication skills through various language learning activities.	PO5
CO3	Analyze the English speech sounds, stress, rhythm, into nation and syllable division for better listening and speaking comprehension.	PO6
CO4	Evaluate and exhibit professionalism in participating in debates and group discussions.	PO2
CO5	Create effective resonate and prepare themselves to face interviews in future.	PO10

CO-PO MAPPING:

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

23ESC118L	IT WORKSHOP (Common to All Branches)	L	T	P	C
		-	-	2	1

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables.
2. To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
3. To teach basic command line interface commands on Linux.
4. To teach the usage of Internet for productivity and self-paced life-long learning
5. To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

LIST OF EXPERIMENTS:

PC HARDWARE & SOFTWARE INSTALLATION:

1. Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.
2. Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.
3. Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.
4. Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva.
5. Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva.

INTERNET & WORLD WIDE WEB:

1. Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally, students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

2. Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

3. Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

4. Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LATEX AND WORD:

1. Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent(FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

2. Using La TeX and Word to create a project certificate. Features to be covered: - Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeXand Word.

3. Creating project abstract Features to be covered: -Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
4. Creating a Newsletter: Features to be covered: - Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL:

EXCEL ORIENTATION: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources. Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

CALCULATING GPA -. Features to be covered: - Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

LOOKUP/VLOOKUP:

Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting.

POWER POINT:

Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts. Master Layouts (slide, template, and notes), Types of views (basic, presentation, slides lotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT:

1. Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

   Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

2. Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas
   Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

3. Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.
   Ex:Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Total Hours: 45

COURSE OUTCOMES:

On the successful completion of this course, the student should be able to,		POs related to COs
CO1	Acquire knowledge on computer system such as system unit, input devices, and output devices connected to the computer.	**PO1**
CO2	Demonstrate the booting process that includes switching on the system, execution of POST routine, then bootstrap loader, and loading of the operating system, and getting it ready for use.	**PO2**
CO3	Demonstrate the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers, web servers, mail-servers, etc.	**PO3**
CO4	Familiarize with parts of MS Office, create and save a document, set page settings, create headers and footers, use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc.	**PO4**
CO5	Prompt the different types of questions using CHATBOT	**PO5**
CO6	Follow the ethical principles in implementing the programs	**PO8**
CO7	Do experiments effectively as an individual and as a team member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understanding about the experiments	**PO10**
CO9	Continue updating their skill related to MS Office, Internet and Computer in future.	**PO12**

TEXT BOOKS:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech,2013, 3rd edition

REFERENCE BOOKS:

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
2. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
3. LaTeX Companion, Leslie Lamport, PHI/Pearson.
4. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
5. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition.

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-		-	3
CO*	**3**	**3**	**3**	**3**	**3**	-	**-**	**3**	**3**	**3**	-	**3**

23ESC115L	COMPUTER PROGRAMMING LAB (Common to All Branches)	L	T	P	C
		-	-	3	1.5

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To provide knowledge on flowchart and algorithm to the given problem
2. To exercise conditional and iterative statements to write C programs
3. To develop the skill of C programs using arrays, strings and functions.
4. To understand C programs using pointers, Structures and union.
5. To familiarize with file handling techniques.

Week 1

Familiarization with programming environment

i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
ii) Exposure to Turbo C, gcc
iii) Writing simple programs using printf(), scanf()

Week 2

Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest Calculation

Week 3

Simple computational problems using arithmetic expressions.

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

Week 4

Simple computational problems using the operator' precedence and associativity

i) Evaluate the following expressions.
   a. A+B*C+(D*E) + F*G
   b. A/B*C-B+A*D/3
   c. A+++B---A
   d. J= (i++) + (++i)
ii) Find the maximum of three numbers using conditional operator
iii) Take marks of 5 subjects in integers, and find the total, average in float

Week 5

Problems involving if-then-else structures.

i) Write a C program to find the max and min of four numbers using if-else.
ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.

iv) Write a C program to simulate a calculator using switch case.
v) Write a C program to find the given year is a leap year or not.

Week 6

Iterative problems e.g., the sum of series
i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Compute sine and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers

Week 7

1D Array manipulation, linear search
i) Find the min and max of a 1-D integer array.
ii) Perform linear search on1D array.
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

Week 8

Matrix problems, String operations, Bubble sort
i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

Week 9

Pointers
i) Write a C program to find the sum of a 1D array using pointers
ii) Enter n students data using Pointers and display failed students list
iii) Demonstrate the arithmetic operations using pointers.
iv) Write a C Program using Pointers to Read in an Array of Integers and Print its Elements in Reverse Order

Week 10

Structures and Unions
i) Demonstrate the differences between structures and unions using a C program.
ii) Write a C program to find the total, average of n students using structures
iii) Write a C program to copy one structure variable to another structure of the same type.
iv) Write a C program to shift/rotate using bit fields.

Week 11

Simple functions using call by value, solving differential equations using Eulers theorem.
i) Write a C function to calculate NCR value.
ii) Write a C function to find the length of a string.

iii) Write a C function to transpose of a matrix.
iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

Week 12

Recursive functions

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the GCD of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a recursive function to find the sum of series.

Week 13

Simple functions using Call by reference.

i) Write a C program to swap two numbers using call by reference.
ii) Write a C program to copy one string into another using pointer.
iii) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

Week 14

File operations

i) Write a C program to write and read text into a file.
ii) Write a C program to write and read text into a binary file using fread () and fwrite()
iii) Copy the contents of one file to another file.
iv) Write a C program to merge two files into the third
v) Write a C program to print last n characters of a given file.

Total Hours: 45

COURSE OUTCOMES:

After the successful completion of this course, the students able to:		POs related to COs
CO1	Read and understand the execution of programs written in C language.	**PO1**
CO2	Analyze the programs on control statements and arrays.	**PO2**
CO3	Design C programs which utilize memory efficiently using programming constructs like pointers.	**PO3**
CO4	Develop the programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C	**PO4**
CO5	Analyze and implement the advanced concepts on functions and File handling techniques.	**PO5**
CO6	Follow the ethical principles in implementing the programs	**PO8**
CO7	Do experiments effectively as an individual and as a team member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understanding about the experiments.	**PO10**
CO9	Continue updating their skill related to loops, pointers and files, implementing programs in future.	**PO12**

TEXT BOOKS:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

REFERENCE WEBSITES:

1. https://onlinecourses.swayam2.ac.in/cec22_cs11
2. https://onlinecourses.nptel.ac.in/noc22_cs40
3. https://www.geeksforgeeks.org.

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	
CO9												3
CO*	3	3	3	3	3	-	-	3	3	3		3

23ESC116L ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP
(Common to All branches of Engineering)

L	T	P	C
0	0	3	1.5

COURSE EDUCATIONAL OBJECTIVES:

1. Gain the knowledge on basic laws
2. Acquire the knowledge on theorems and Characteristics.
3. Analyze the Power and Power factor measurement
4. Analyze various characteristics of electrical circuits, electrical machines and measuring instruments
5. Measurement of various electrical parameters; Household and commercial wiring

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
   - Provide some exercises so that hardware tools and instruments are learned to be used by the students.
2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
   - Provide some exercises so that measuring instruments are learned to be used by the students.
3. Components: Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
   - Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of Ohms law, KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

COURSE OUTCOMES:

On successful completion of the course the student could be		POs related to COs
CO1	Understand the Electrical circuit design concept, measurement of resistance, power, power factor; concept of wiring and operation of Electrical Machines and Transformer	PO1, PO2, PO3
CO2	Apply the theoretical concepts and operating principles to derive mathematical models for circuits, Electrical machines and measuring instruments; calculations for the measurement of resistance, power and power factor	PO1, PO2, PO3
CO3	Apply the theoretical concepts to obtain calculations for the measurement of resistance, power and power factor.	PO1, PO2, PO3
CO4	Analyze various characteristics of electrical circuits, electrical machines and measuring instruments	PO1, PO2, PO3, PO12
CO5	Design suitable circuits and methodologies for the measurement of various electrical parameters; Household and commercial wiring.	PO1, PO2, PO3, PO12

REFERENCE BOOKS:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, DhanpatRai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

CO-PO MAPPING:

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

PART B: ELECTRONICS ENGINEERING LAB

COURSE EDUCATIONAL OBJECTIVES:

1	Identify & testing of various electronic components.
2	Understand the usage of electronic measuring instruments.
3	Evaluate the performance of rectifiers
4	Study the characteristics of various electron devices
5	Obtain the operation of a digital circuit.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

LIST OF EXPERIMENTS:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

COURSE OUTCOMES:

On successful completion of the course the student could be		POs related to COs
CO1	Identify & testing of various electronic components.	PO1, PO2, PO3,
CO2	Understand the usage of electronic measuring instruments.	PO1, PO2, PO3,
CO3	Evaluate the performance of rectifiers	PO1, PO2, PO3,
CO4	Plot and discuss the characteristics of various electron devices	PO1, PO2, PO3, PO12
CO5	Obtain the operation of a digital circuit.	PO1, PO2, PO3, PO12

REFERENCES:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009 3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

CO-PO MAPPING:

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

23HSM114L	**NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE**	**L**	**T**	**P**	**C**
	(Common to All branches of Engineering)	**0**	**0**	**1**	**0.5**

COURSE EDUCATIONAL OBJECTIVES:

1. To impart discipline, character, and fraternity amongst young citizens
2. To train them to work in teams/groups to enhance their team spirit.
3. To enable the students to acquire leadership qualities.
4. To induce social consciousness among students through various activities.
5. To instill self-confidence and the ideals of selfless service
6. To engage students in responsible and challenging actions for the common good.

COURSE OUTCOMES:

After the completion of the course the student will be able to

1. Understand the importance of discipline, character and service motto.
2. Outline the needs and problems of the community
3. Solve some societal issues by applying acquired knowledge, facts, and techniques
4. Explore human relationships by analyzing social problems
5. Determine to extend their help for the fellow beings and downtrodden people
6. Develop leadership skills and civic responsibilities

UNIT-I: ORIENTATION

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

ACTIVITIES:

1. Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
2. Conducting orientations programs for the students –future plans-activities-releasing road map etc.
3. Displaying success stories-motivational biopics- award winning movies on societal issues etc.
4. Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT-II: NATURE & CARE

ACTIVITIES:

1. Best out of waste competition.
2. Poster and signs making competition to spread environmental awareness.
3. Recycling and environmental pollution article writing competition.
4. Organizing Zero-waste day.
5. Digital Environmental awareness activity via various social media platforms.
6. Virtual demonstration of different eco-friendly approaches for sustainable living.
7. Write a summary on any book related to environmental issues.

UNIT-III: COMMUNITY SERVICE

ACTIVITIES:

1. Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities-experts-etc.
2. Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
3. Conducting consumer Awareness. Explaining various legal provisions etc.
4. Women Empowerment Programs - Sexual Abuse, Adolescent Health and Population Education.
5. Any other Programs in collaboration with local charities, NGOs etc.

REFERENCE BOOKS:

1. Nirmalya Kumar Sinha & Surajit Majumder, A Text Book of National Service Scheme Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. Red Book - National Cadet Corps – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. Social Problems in India, Rawat Publications, New Delhi.

GENERAL GUIDELINES:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students

EVALUATION GUIDELINES:

1. Evaluated for a total of 100 marks.
2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva• voce on the subject.

I B.TECH II SEM

		L	T	P	C
23BSC121T	**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**	**L**	**T**	**P**	**C**
	(Common to All Branches of Engineering)	**2**	**1**	**-**	**3**

COURSE EDUCATIONAL OBJECTI VES:

1. To enlighten the learners in the concept of differential equations and multivariable calculus.
2. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications

UNIT-I: DIFFERENTIAL EQUATIONS OF FIRST ORDER AND FIRST DEGREE (9)

Linear differential equations – Bernoulli's equations - Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay, Electrical circuits.

UNIT-II: LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER (CONSTANT COEFFICIENTS) (9)

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskean, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT-III: PARTIAL DIFFERENTIAL EQUATIONS (9)

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method and Non-Linear (Standard forms) equations. Homogeneous Linear Partial differential equations with constant coefficients (Method of Separation of variables).

UNIT-IV: VECTOR DIFFERENTIATION (9)

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT-V: VECTOR INTEGRATION (9)

Line Integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Solve the first order differential equations related to various engineering fields	**PO1, PO2,PO3**
CO2	Solve the higher order differential equations related to various engineering fields.	**PO1, PO2,PO3**
CO3	Identify solution methods for partial differential equations that model physical processes.	**PO1, PO2,PO3**
CO4	Interpret the physical meaning of different operators such as gradient, curl and divergence.	**PO1, PO2,PO3**
CO5	Estimate the work done against a field, circulation and flux using vector calculus	**PO1, PO2,PO3**

TEXT BOOKS:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

REFERRENCE BOOKS:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, , McGraw Hill Education, 2017

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/111/106/111106100/
1. https://www.youtube.com/watch?v=OBhZvyhc8JQ&t=982s
2. https://nptel.ac.in/courses/111/106/111106100/
3. https://www.youtube.com/watch?v=3zCdNO2xp3s
4. https://www.youtube.com/watch?v=GFKggEkKtLM
5. https://www.youtube.com/watch?v=SZCsFS9izfQ
6. https://www.youtube.com/watch?v=ma1QmE1SH3I

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	2	-	-	-	-	-	-	-	-	-
CO.2	3	3	2	-	-	-	-	-	-	-	-	-
CO.3	3	3	2	-	-	-	-	-	-	-	-	-
CO.4	3	3	2	-	-	-	-	-	-	-	-	-
CO.5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	3	3	2	-	-	-	-	-	-	-	-	-

23BSC111T	APPLIED CHEMISTRY	L	T	P	C
	(Common to EEE, ECE, CSE, CSE (AI&ML), CSE (AI) and CSE (DS))	2	1	0	3

COURSE EDUCATIONAL OBJECTIVES:

1. To train the students about the concept of Quantum Mechanics and Molecular Orbital theory.
2. To familiarize Knowledge and applications of modern engineering materials
3. To understand the concept of Electro Chemistry with its applications such as battery, fuel cells and sensors
4. To develop knowledge on the concept and applications of polymers
5. To introduce instrumental methods such as UV, IR and Chromatography with applications

UNIT-I:STRUCTURE AND BONDING MODELS (9)

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ2, particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π- molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT-II:MODERN ENGINEERING MATERIALS (9)

Semiconductors, band diagram in solids, Semiconductor devices (p-n junction diode as rectifier and transistors)
Super conductors-Introduction basic concept, applications. Supercapacitors: Introduction, Basic Concept-Classification – Applications.
Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

UNIT-III:ELECTROCHEMISTRY AND APPLICATIONS (9)

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations).
Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.
Primary cells – Zinc-air battery, Secondary cells –lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

UNIT-IV:POLYMER CHEMISTRY (9)

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation.
Plastics –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres. Elastomers–Buna-S, Buna-N–preparation, properties and applications.
Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

UNIT-V: INSTRUMENTAL METHODS AND APPLICATIONS (9)

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible

Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

COURSE OUTCOMES

On successful completion of the course the students will be able to		**POs**
CO1	Demonstrate knowledge based on quantum mechanics and molecular orbital theory	**PO1, PO2**
CO2	Demonstrate knowledge on engineering materials with applications	**PO1, PO2, PO6**
CO3	Demonstrate knowledge on electrochemistry with analytical skills and applications such as battery, fuel cells and sensors	**PO1, PO2, PO6**
CO4	Demonstrate knowledge on polymers with applications related to society and sustainability	**PO1, PO2, PO6,PO7**
CO5	Demonstrate knowledge on principles and instrumentations of spectroscopy and chromatography	**PO1, PO2**

TEXT BOOKS:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

REFERENCE BOOKS:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.M. Lehn, Supra Molecular Chemistry, VCH Publications

CO-PO MAPPING

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

I B.TECH II SEM

23BSC113T	ENGINEERING PHYSICS	L	T	P	C
	(Common to All Engineering Branches)	2	1	0	3

COURSE EDUCATIONAL OBJECTIVES:

1. To study the intensity variation of light due to interference, diffraction and polarization
2. To understand the fundamental of crystals and their structures.
3. To recognize various types of polarization of dielectrics and classification of the magnetic materials.
4. To study the principles of quantum mechanics and implementing it the one-dimensional motion of particles and the band theory of solids.
5. To provide an overview of semiconductor and identification of type of semiconductor using Hall effect.

UNIT-I: WAVE OPTICS (9)

Interference: Introduction **-** Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings-Determination of wavelength and refractive index.
Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit– Diffraction Grating -Applications
Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates. -Applications

UNIT-II: CRYSTALLOGRAPHY AND X-RAY DIFFRACTION (9)

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.
X-**ray diffraction:** Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods.

UNIT-III: DIELECTRIC AND MAGNETIC MATERIALS (9)

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT-IV: QUANTUM MECHANICS AND FREE ELECTRON THEORY (9)

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.
Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free

electron theory - Fermi-Dirac distribution - Density of states - Fermi energy.

UNIT-V: Semiconductors **(9)**

Semiconductors: Formation of energy bands – classification of crystalline solids – Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation - Hall effect and its applications

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Identify the importance and applications Wave Optics in various Streams of Engineering	PO1, PO2
CO2	Explain the fundamental of crystals and their structures	PO1, PO2
CO3	Elucidate the importance, properties and applications of Magnetic materials and dielectrics	PO1, PO2
CO4	Use ideas with mathematical solutions to Quantum mechanics and its applications in various atomic phenomena	PO1, PO2
CO5	Provide knowledge about semiconductor and different type of semiconductor using Hall effect.	PO1, PO2

TEXT BOOKS:

1. A Text book of Engineering Physics - M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy,
2. S. Chand Publications, 11th Edition 2019.
3. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).

REFERENCE BOOKS:

1. Solid State Physics, by Kittel, Wiley
2. Engineering Physics by Gaur and Gupta, Dhanpatrai Publications
3. Engineering Physics by K.Thyagarajan, McGraw Hill.

REFERENCE WEBSITE:

https://archive.nptel.ac.in/courses/122/107/122107035/

https://archive.nptel.ac.in/courses/112/106/112106293/

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	-	-	-	-	-	-	-	-	-	-
CO.2	3	3	-	-	-	-	-	-	-	-	-	-
CO.3	3	3	-	-	-	-	-	-	-	-	-	-
CO.4	3	3	-	-	-	-	-	-	-	-	-	-
CO.5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	3	3	-	-	-	-	-	-	-	-	-	-

I B.TECH II SEM

		L	T	P	C
23ESC111T	**BASIC CIVIL AND MECHANICAL**				
	(Common to All Engineering Branches)	**2**	**1**	**0**	**3**

Basic Civil Engineering

(Part A)

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To study the Overview of civil engineering and basic concepts on construction materials.
2. To study the basic concepts in the field of surveying & Foundation Engineering
3. To study the basic transportation, water resources and environmental engineering.

UNIT –1: INTRODUCTION TO CIVIL ENGINEERING (8)

BASICS OF CIVIL ENGINEERING: Overview of civil engineering — Civil engineering contributions to the welfare of society – Various disciplines of civil engineering – Basic concepts and scope of structural engineering, geo-technical engineering, transportation engineering, hydraulics , water resources engineering, and environmental engineering **CONSTRUCTION TECHNOLOGY:** Fundamental concepts of building planning for residential buildings and Sequences of Work in Building Construction – Introduction to Prefabricated construction Techniques & Green buildings concept

Construction Materials: Cement – Aggregate – Bricks – Cement – Concrete – Steel – Timber – Modern materials. (Brief discussion only)

UNIT –2: SURVEYING & FOUNDATION ENGINEERING (8)

SURVEYING: Objectives of surveying – Horizontal measurements – Angular measurements – Introduction to bearings levelling instruments used for levelling – Simple problems on levelling and bearings– Contour mapping. (Brief discussion only)

FOUNDATIONS ENGINEERING: Bearing capacity of soil, functions of foundations, types – shallow and deep- Load bearing and framed structures (Brief discussion only)

UNIT –3: TRANSPORTATION AND WATER RESOURCES AND ENVIRONMENTAL ENGINEERING (8)

TRANSPORTATION ENGINEERING: Importance of transportation in Nation's economic development – Types of highway pavements – Flexible pavements and rigid pavements – Simple differences– Basics concepts on harbor, tunnel, airport, and railway engineering. (Brief discussion only)

WATER RESOURCES AND ENVIRONMENTAL ENGINEERING: Introduction on water resources and environmental engineering – Sources of water – Quality of water and Specifications – Introduction to hydrology – Rainwater harvesting – Water storage and conveyance structures – Fundamental concepts on dams and reservoirs. (Brief discussion only)

TOTAL HOURS: 24

(**Note:** The subject covers only the basic principles of Civil Engineering. The evaluation shall be intended to test only the fundamentals of the subject)

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.	**PO1, PO12**
CO2	Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying and Basics concepts of foundations engineering	**PO1, PO12**
CO3	Realize the importance of Transportation Water Resources and Environmental Engineering.	**PO1, PO12**

TEXT BOOKS:

1. Indian Standard Specifications for Drinking Water is : 10500 – 1983
2. G.Shanmugam and M.S.Palanichamy, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi , 1996.
3. Venugopal K,Prahu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, Chennai.

REFERENCE BOOKS:

1. Building Material by S K Duggal New Age International Publishers; Second Edition.
2. Text book of surveying, C.Venkataramaiah, Universities Press.
3. S.K.Khanna & C.E.G.Justo, Highway Engineering Nemchand & Bros., 7th edition (2000).
4. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers,New Delhi, 2015.
5. P.K.Nag, "Power Plant Engineering", McGraw-Hill Education Pvt. Ltd., New Delhi,4/e, 2014.
6. P.N.Modi,‖ Irrigation and Water Resources & Water Power Engineering‖, Standard Book House.

REFERENCE WEBSITE:

1. https://onlinecourses.nptel.ac.in/noc22_ce42/preview

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	1
CO.2	3	-	-	-	-	-	-	-	-	-	-	1
CO.3	3	-	-	-	-	-	-	-	-	-	-	1
CO*	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

BASIC MECHANICAL ENGINEERING
(Part-B)

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. To study the basic concepts materials, machining, and scope of mechanical engineering.
2. To study the basic concepts in the field of thermal engineering.
3. To study the basic principles of power plants, mechanical transmission system and fundamentals of robotics.

UNIT –1: INTRODUCTION TO MATERIALS & MANUFACTURING ENGINEERING (8)

Introduction to Mechanical Engineering: Role of mechanical engineering in industries and society – Technologies and scope in different sectors such as energy, manufacturing, design, automotive, aerospace, and marine. **Engineering Materials**: Introduction on metals-ferrous and non-ferrous, ceramics, composites, smart materials. **Manufacturing Processes:** Basic principles and applications of casting, forming, joining processes, and machining – Introduction to CNC machines, 3D printing, and smart manufacturing.

UNIT –2: INTRODUCTION TO THERMAL ENGINEERING (8)

Thermal Engineering: Working principle of boilers. **Refrigeration:** Refrigeration and air-conditioning cycles – Units of refrigeration – Refrigerants – Vapour-compression and absorption system. **Air Conditioning:** Terminology in air conditioning – Working principle of window, split, and central air conditioning system. **IC Engines:** Basic concepts on Otto cycle and Diesel cycle – Components of IC engines – SI/CI Engines – Working principle of two/four stroke petrol and diesel engines – Differences between petrol and diesel engines – Basic concepts on electric and hybrid vehicles.

UNIT –3: POWER PLANTS, MECHANICAL TRANSMISSION AND ROBOTICS (8)

Power Plants: Working principle of steam, diesel, hydro, gas turbine, and nuclear power plants. **Mechanical Power Transmission**: Belt drives, chain, rope drives, gear drives and their applications. **Introduction to Robotics**: Joints & links, configurations, and applications of robotics.

(**Note:** The subject covers only the basic principles of Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)

Total Hours: 24

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand the concepts of engineering materials and basic manufacturing process.	**PO1, PO2, PO3**
CO2	Describe the basic concepts of thermal engineering, refrigeration, air conditioning and IC engines.	**PO1, PO2, PO3**
CO3	Describe the working of different mechanical power transmission systems, power plants, and fundamentals of robotics.	**PO1, PO2, PO3**

TEXT BOOKS:

1. G.Shanmugam and M.S.Palanichamy, "Basic Civil and Mechanical Engineering", Tata McGraw Hill Publishing Co., New Delhi , 1996.
2. Venugopal K,Prahu Raja V, "Basic Mechanical Engineering", Anuradha Publishers, Chennai, 2000.

REFERENCE BOOKS:

1. Materials Science and Engineering: An Introduction, William D. Callister, 9/e, 2014,Wiley India Pvt. Ltd.
2. Serope Kalpakjian and Steven R. Schmid, "Manufacturing Engineering and Technology (SI Edition)", Pearson Education, New Delhi, 7/e, 2018.
3. Ian Gibson, David W.Rosen and Brent Stucker, "Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping and Direct Digital Manufacturing", Springer, 2/e, 2015.
3. V. Ganesan, "Internal Combustion Engines", Tata McGraw-Hill Education Pvt. Ltd., 4/e, 2012.
4. C P Arora, "Refrigeration and Air Conditioning", Tata McGraw-Hill Education Pvt. Ltd., Noida, 3/e, 2008.
5. M.Ehsani, Y.Gao,S.Gayand AliEmadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles" Fundamentals, Theory and Design", CRC Press, 2005
6. P.K.Nag, "Power Plant Engineering", McGraw-Hill Education Pvt. Ltd., New Delhi,4/e, 2014.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112103316
2. https://nptel.ac.in/courses/112106293
3. https://nptel.ac.in/courses/112104290

CO-PO Mapping

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	1
CO.2	3	-	-	-	-	-	-	-	-	-	-	1
CO.3	3	-	-	-	-	-	-	-	-	-	-	1
CO*	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

I B.TECH II SEM

23EEE121T	ELECTRICAL CIRCUIT ANALYSIS	L	T	P	C
		2	1	0	3

PRE-REQUISITES: Basic Electrical and Electronics Engineering

COURSE EDUCATIONAL OBJECTIVES:

1. Develop Proficiency in Circuit Analysis Techniques
2. Analyze and Solve Electrical Circuits
3. Apply AC Circuit Analysis Techniques
4. Comprehend the Magnetic Circuit Principles
5. Learn how to apply all network theorems

UNIT-1: FUNDAMENTAL CONCEPTS OF ELECTRICAL CIRCUITS (9)

Circuit concept, RLC parameters - Voltage and Current sources, Independent and dependent sources, source transformation - Kirchhoff's laws - network reduction techniques, series, parallel, series parallel, star-to-delta transformation - Nodal and Mesh analysis.

UNIT-2: SINGLE PHASE AC CIRCUITS (9)

R.M.S, Average values and form factor for different periodic waveforms - phase and phase difference of sinusoidal alternating quantities - steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation - response of pure resistance, inductance, capacitance, series RL circuit, series RC circuit, series RLC circuit, parallel RL circuit, parallel RC circuit.

UNIT-3: MAGNETIC CIRCUITS (9)

Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.

UNIT-4: RESONANCE AND LOCUS DIAGRAMS (9)

Series Resonance: Characteristics of a series resonant circuit, Q-factor, selectivity and bandwidth, expression for half power frequencies; Parallel resonance: Q-factor, selectivity and bandwidth; Locus diagram: RL, RC, RLC with R, L and C variables.

UNIT-5: NETWORK THEOREMS FOR (DC & AC EXCITATION) (9)

Thevenin's Theorem, Norton's Theorem, Tellegens Theorem, Maximum Power Transfer Theorem, Superposition Theorem, Reciprocity theorem, Millman's theorem and Compensation theorem.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course the student will be able to,		Pos
CO1	Remember the basic electrical elements and different fundamental laws.	PO1, PO2, PO3, PO12
CO2	Analyze series RL, RC, and RLC circuits under sinusoidal excitation	PO1, PO2, PO3, PO12
CO3	Apply analogies between electrical and magnetic circuits.	PO1, PO2,PO3,PO12
CO4	Calculate key parameters of resonance circuits and learn about locus diagrams and their applications	PO1, PO2, PO3, PO12
CO5	Evaluation of Network theorems for DC and AC Excitation.	PO1, PO2, PO3, PO12

TEXT BOOKS:

1. William H. HaytJr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, edition, New Delhi, 2013.
2. Jack Kemmerly, William Hayt and Steven Durbin," Engineering Circuits Analysis," Tata Mc Graw Hill Education, 2005, sixth edition.
3. M. E. Van Valkenburg "Network Analysis" Pearson Education, 2019, Revised Third Edition.

REFERENCE BOOKS:

1. Charles K. Alexander and Mathew "Fundamentals of Electrical Circuits**"**, N.O. Sadiku,Mc Graw Hill Education (India), 2013, Fifth Edition
2. Mahmood Nahvi, Joseph Edminister, and K. Rao," Electric Circuits (Schaum's outline Series)" Mc Graw Hill Education, 2017, Fifth Edition.
3. David A. Bell, "Electric Circuits" Oxford University Press, 2009, Seventh Edition
4. Chakrabarti A, "Circuits Theory (Analysis and synthesis), DhanpathRai& Sons, New Delhi,1999.

REFERENCE WEBSITE:

1. https://onlinecourses.nptel.ac.in/noc23_ee81/preview
2. https://nptel.ac.in/courses/108104139
3. https://nptel.ac.in/courses/108106172

CO-PO Mapping:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	2
CO2	3	3	2	-	-	-	-	-	-	-	-	2
CO3	3	2	2	-	-	-	-	-	-	-	-	2
CO4	3	3	2	-	-	-	-	-	-	-	-	2
CO5	3	3	2	-	-	-	-	-	-	-	-	2
CO*	**3**	**2.6**	**2**	-	-	-	-	-	-	-	-	**2**

I B.TECH II SEM

23BSC115L	APPLIED CHEMISTRY LAB	L	T	P	C
		-	-	2	1

COURSE EDUCATIONAL OBJECTIVES:

1. Verify the fundamental concepts with experiments.
2. To provide solid foundation in chemistry laboratory to solve engineering problems
3. To apply theoretical principles in preparing polymers and non-material's
4. To apply theoretical principles in estimating strength of acid, ferrous ion
5. To apply theoretical concept and principles in determining cell constant and conductance of solution, strength of acids by conduct metric titrations and PH metric titrations, redox potential, emf and viscosity
6. To experience the importance of theory by utilizing analytical tools such as pb-acid battery, colorimeter, ostwalds viscometer, potentiometer, conductivity meter and PH meter
7. To experience the importance of theory by performing spectroscopic investigations, using modern instrumental tools such as UV- spectrophotometer and IR spectrometer.

LIST OF EXPERIMENTS

1. Measurement of 10Dq by spectrophotometric method.
2. Conduct metric titration of strong acid (HCl) vs. strong base (NaOH)
3. Conduct metric titration of weak acid (CH3COOH) vs. strong base (NaOH)
4. Determination of cell constant and conductance of potassium chloride solutions
5. Potentiometry-determination of redox potentials and emfs (emf titration of Fe^{2+} with $cr2O7^{2-}$)
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a polymer (Bakelite).
8. Verification Lambert-Beer's law for KMnO4 by colorimetry.
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of ZnO nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry
13. Determination of molecular weight of a polymer using Ostwald viscometer
14. pH metric titration of strong acid (HCl) vs strong base (NaOH)

Note: Any **TEN** of the listed experiments are to be conducted, out of which any **TWO** experiments may be conducted in virtual mode.

COURSE OUTCOMES:

On the successful completion of the course students will be able to		POs
CO1	Demonstrate knowledge on preparation of bakerite and nanomaterial	**PO1**
CO2	Analyze ferrous iron colorimetry and ferrous iron by dichrometry, analyses acid in lead acid battery	**PO2**
CO3	Conduct investigations of lead in lead acid battery, wave length determination in spectrophotometer, conductometric titrations of acids and bases	**PO4**
CO4	Analyze using tools such as UV and IR spectrophotometers	**PO5**
CO5	Follow the ethical principles in implementing the programmes	**PO8**
CO6	Conduct experiments effectively as an individual and as a team member in a group	**PO9**
CO7	Communicate verbally and in written form the understanding about the experiments	**PO10**
CO8	Continue updating their skill related to nanomaterials and battery and implementing programmes in future	**PO12**

REFERENCE BOOK:

1. "Vogel's Quantitative Chemical Analysis, 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar.

CO-PO MAPPING

CO/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**-**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

I B.TECH II SEM

23BSC117L	ENGINEERING PHYSICS LAB (Common to All Engineering Branches)	L	T	P	C
		-	-	2	1

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. To Operate optical instruments like travelling microscope and spectrometer.
2. To Estimate the wavelengths of different colors using diffraction grating.
3. To Plot the intensity of the magnetic field of circular coil carrying current with distance.
4. To Calculate the band gap of a given semiconductor.
5. To verify the laws of stretched strings

LIST OF EXPERIMENTS

1. Determination of radius of curvature of a given Plano convex lens by Newton's rings.
2. Determination of thickness of a thin wire using wedge method
3. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
4. Determination of wavelength of Laser light using diffraction grating.
5. Determination of energy gap of a semiconductor using p-n junction diode.
6. Determination of particle size using laser source
7. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
8. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
9. Sonometer: Verification of laws of stretched string.
10. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration
11. Determination of temperature coefficients of a thermistor.
12. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

Note: Any **TEN** of the listed experiments are to be conducted. Out of which any **TWO** experiments may be conducted in virtual mode.

COURSE OUTCOMES:

On the successful completion of the course students will be able to		POs
CO1	Demonstrate Knowledge on measurement of various physical quantities using optical methods and fundamentals of magnetic fields	PO1
CO2	Identify different physical properties of materials like band gap, magnetic field intensity etc, for engineering and technological applications	PO2
CO3	Provide valid conclusions on phenomena Interference and Diffraction	PO4
CO4	Analyze using tools such Torsional pendulum.	PO5
CO5	Follow the ethical principles in implementing the programmes	PO8
CO6	Conduct experiments effectively as an individual and as a team member in a group	PO9

CO7	Communicate verbally and in written form the understanding about the experiments	**PO10**
CO8	Continue updating their skill related to nanomaterials and battery and implementing programmes in future	**PO12**

REFERENCE BOOK:

1. A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.

WEB RESOURCE:

1. ***URL***:*www.vlab.co.in*

CO-PO MAPPING

CO/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	3	-	-	-	-
CO5	-	-	-	-	-	-	-	-	3	-	-	-
CO6	-	-	-	-	-	-	-	-	-	3	-	-
CO7	-	-	-	-	-	-	-	-	-	-	-	3
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**-**	**3**	**-**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

I B.TECH II SEM

23ESC117L	**ENGINEERING WORKSHOP**	**L**	**T**	**P**	**C**
	(Common to All Branches)	**-**	**-**	**3**	**1.5**

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. To provide exposure to the students with hands on experience on various basic engineering practices in civil, mechanical, and electrical engineering.

Trade for Exercises:

1. **Demonstration:** Safety practices and precautions to be observed in workshop.
2. **Carpentry:** Familiarity with different types of woods and tools used in wood working and make following joints.
   a. Middle T lap joint or Half lap joint
   b. Mortise and tenon joint
   c. Dove tail joint or bridle joint
3. **Sheet Metal:** Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
   a. Tapered tray
   b. Conical funnel
   c. Elbow pipe
   d. Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   a. V fit
   b. Dove tail joint
   c. Semi-circular fit / Square fit
   d. Bicycle tire puncture
5. **House Wiring:** Familiarity with different types of basic electrical circuits and make the following connections.
   a. Parallel and series
   b. Two-way switch
   c. Godown lighting
   d. Tube light
   e. Three phase motor
   f. Soldering of wires
6. **Basic Machining:** Familiarity with different types of tools used in metal parts and practicing basic machining operation.
   a. Simple plain turning / simple step turning.
   b. Drilling and tapping
7. **Plumbing:** Familiarity with plumbing tools, Preparation of pipe joints with coupling for same diameter and with reducer for different diameters and make the following tap connections
   a. Single tap connections
   b. Multi tap connections.

Trade for Demonstration:

1. **Foundry Trade:** Demonstration and practice on moulding tools and processes, preparation of green sand moulds for single and split patterns.
2. **Welding:** Demonstration and practice on Arc Welding and Gas welding Preparation of Lap joint and Butt joint.

TEXT BOOKS:

1. Serope Kalpak Jain and Steven R. Schmid, "Manufacturing Processing forEngineering Materials (SI Edition)", Pearson Education, New Delhi, 6/e, 2018.
2. P.N. Rao, "Manufacturing Technology - Foundry, Farming and Welding, Volume-I",Tata McGraw-Hill Education Pvt. Ltd., Noida, 5/e, 2018.

REFERENCE BOOKS:

1. Hajra Choudhury S.K and Nirjhar Roy, "Elements of Workshop Technology, Volume-I", Media Promoters and Publishers Pvt.Ltd, 15/e, 2010.
2. Roy A Lindberg, "Process and Materials of Manufacturing", Pearson Education, New Delhi, 4/e, 2015.
3. R.K. Jain, "Production Technology", Khanna publishers, New Delhi, 17/e, 2011.
4. R.K. Rajput, "A Textbook of Manufacturing Technology: Manufacturing Processes", Laxmi Publications (P) Ltd., New Delhi, 2/e, 2017.
5. "A Text book of Manufacturing Technology-I", P.C.Sharma, S.Chand& Company Pvt. Ltd., New Delhi, 1/e, 2011.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112/104/112104301/
2. https://nptel.ac.in/courses/112/107/112107219/

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Demonstrate the knowledge on different tools used in carpentry, fitting, sheet metal, house wiring and plumbing sections and also basic machining process	PO1
CO2	Analyze the basic pipeline connection using different joints	PO2
CO3	Design and develop simple components by using different materials includes wood, GI sheet and MS plates	PO3
CO4	Apply basic electrical engineering tools on the house wiring practice	PO5
CO5	Follow the ethical principles in while doing the exercises.	PO8
CO6	Do the exercises effectively as an individual and as a team member in a group	PO9
CO7	Communicate verbally among team members and in written form, the understanding about the trade exercises.	PO10
CO8	Continue updating their skill related to trades.	PO12

CO-PO MAPPING

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

I B.TECH II SEM

23EEE122L **ELECTRICAL CIRCUIT LAB**

L	T	P	C
0	0	3	1.5

PRE-REQUISITES: Basic Electrical Engineering Workshop

COURSEOBJECTIVE:

1. Gain practical experience on fundamental electric laws.
2. Gain practical experience on node and mesh analysis.
3. Evaluate the phase angle of RLC circuits practically.
4. Introduce the practical approach on identifying the resonance circuits and verification of theorems.
5. Evaluate the key parameters of mutually coupled coils through experimentation.

Any ten of the following Experiments are Required to Be Conducted

1. Verification of KCL and KVL.
2. Verification of node and mesh analysis.
3. Verification of network reduction techniques.
4. Determination of cold and hot resistance of an electric lamp
5. Determination of Parameters of a choke coil.
6. Determination of self, mutual inductances, and coefficient of coupling
7. Series and parallel resonance
8. Locus diagrams of R-L (L Variable) and R-C (C Variable) series circuits
9. Verification of Superposition theorem
10. Verification of Thevenin's and Norton's Theorems
11. Verification of Maximum power transfer theorem
12. Verification of Compensation theorem
13. Verification of Reciprocity and Millman's Theorems

COURSE OUTCOMES:

At the end of the course, students will able to		Pos
CO1	Understand the fundamental electrical laws in engineering applications.	**PO1**
CO2	Verification of node and mesh analysis.	**PO2**
CO3	Design electrical circuits for measuring complicated electrical parameters.	**PO3**
CO4	Determination of resistance and Parameters of a choke coil	**PO4**
CO5	Evaluate the self-inductance, mutual inductance and coefficient of coupling of mutually coupled coils through experimentation.	**PO4**
CO6	Determination of Series and parallel resonance and verification of all theorems	**PO8**
CO7	Do experiments effectively as an individual and as a team member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understanding about the experiments.	**PO10**
CO9	Continue updating their skill related to electrical circuits	**PO12**

REFERNCE BOOKS:

1. Jack Kemmerly, William Hayt and Steven Durbin "Engineering Circuits Analysis", Tata Mc Graw Hill Education, 2005, sixth edition.
2. M. E. Van Valkenburg, "Network Analysis", Pearson Education, 2019, Revised Third Edition

REFERENCE WEBSITE:

https://nptel.ac.in/courses/108/104/108104139/

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	3	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	3	3	3	3	-	-	-	3	3	3	-	3

I B.TECH II SEM

		L	T	P	C
23HSM113L	**Health And Wellness, Yoga and Sports** **(Common to All branches of Engineering)**	**0**	**0**	**1**	**0.5**

COURSE EDUCATIONAL OBJECTIVES:

1. To maintain their mental and physical wellness upright and develop ability in them to cope up with the stress arising in the life.
2. To create space in the curriculum to nurture the potential of the students in sports/games/yoga etc.
3. To introduce a practice oriented introductory course on the subject.

COURSE OUTCOMES:

After completion of the course the student will be able to

1. Be Physical fit to perform daily routine without undue fatigue.
2. Be Mentally alert and Socially Cohesive
3. Consider success and failure equally.
4. Develop Positive Personality
5. Improve Leadership qualities

UNIT-I:

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

1. Organizing health awareness programmes in community
2. Preparation of health profile
3. Preparation of chart for balance diet for all age groups

UNIT- II:

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT-III:

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

1. Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket

etc.
Practicing general and specific warm up, aerobics

2. Practicing cardio respiratory fitness, treadmill, run test, 9 min walk, skipping and running.

REFERENCE BOOKS:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

GENERAL GUIDELINES:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

EVALUATION GUDIELINES:

1. Evaluated for a total of 100 marks.
2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, total to 90 marks.

A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

		L	T	P	C
23BSC231T	**COMPLEX VARIABLES AND NUMERICAL METHODS**	**2**	**1**	**0**	**3**

PRE-REQUISITES: Algebra, Calculus, Differential equations, Real Analysis.

COURSE EDUCATIONAL OBJECTIVES:

1. To analyze the functions of complex variable with a review of elementary complex Functions and to learn continuity, differentiability and analyticity of a complex function
2. To understand the Taylor and Laurent expansion with their use in finding out the residue and improper integral.
3. To develop skill to analyze appropriate method to find the root of the Algebraic and Transcendental Equations and to develop skill to apply the concept of interpolation
4. To learn the method of evaluation of numerical derivative, numerical integration
5. To learn the method of evaluation of solve ordinary differential equations numerically using numerical methods.

UNIT I: COMPLEX VARIABLE – DIFFERENTIATION (9)

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method**.**

UNIT II: COMPLEX VARIABLE – INTEGRATION (9)

Line integral, Cauchy's integral theorem (Simple Case), Cauchy Integral formula, Power series expansions: Taylor's series, Laurent's series, zeros of analytic functions, singularities, Residues, Cauchy Residue theorem (without proof).

UNIT III: SOLUTION OF ALGEBRAIC & TRANSCENDENTAL EQUATIONS AND INTERPOLATION (9)

Introduction-Bisection Method-Iterative method, Regula-falsi method and Newton Raphson method Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae.

UNIT IV: NUMERICAL DIFFERENTIATION, NUMERICAL INTEGRATION AND CURVE FITTING (9)

Numerical differentiation: Newton's forward and backward formulae

Numerical integration: Trapezoidal rule - Simpson's 1/3 Rule - Simpson's 3/8 Rule

Curve fitting: Fitting of straight line, second-degree and Exponential curve by method of least squares.

UNIT V: SOLUTION OF INITIAL VALUE PROBLEMS TO ORDINARY DIFFERENTIAL EQUATIONS (9)

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's and modified Euler's methods-Runge-Kutta methods (second and fourth order).

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos related to COs
CO1	Analyze limit, continuity and differentiation of functions of complex variables and Understand Cauchy-Riemann equations, analytic functions and various properties of analytic functions.	**PO1,PO2,PO3**
CO2	Understand Cauchy theorem, Cauchy integral formulas and apply these to evaluate complex integrals.	**PO1,PO2,PO3**
CO3	Apply numerical methods to solve algebraic and transcendental equations and to Derive interpolating polynomials using interpolation formulae.	**PO1,PO2,PO3**
CO4	Demonstrate knowledge in finding the numerical values to derivatives, integrals through different mathematical methods and constructing a curve, or mathematical function, that has the best fit to a series of data points	**PO1,PO2,PO3**
CO5	Demonstrate knowledge in solving ordinary differential equations numerically through various methods	**PO1,PO2,PO3**

TEXT BOOKS:

1. B.S.Grewal,Higher Engineering Mathematics, KhannaPublishers,2017, 44th Edition
2. S.S Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2018, 10th Edition.
2. B.V.Ramana, Higher Engineering Mathematics, by Mc Graw Hill publishers
3. R.K.JainandS.R.K.Iyengar,Advanced Engineering Mathematics, Alpha Science International Ltd.,2021 5th Edition(9th reprint).

REFERENCE WEBSITE:

1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview
2. https://onlinecourses.nptel.ac.in/noc20_ma50/preview
3. http://nptel.ac.in/courses/111105090

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	3	-	-	-	-	-	-	-	-	-
CO.2	3	3	3	-	-	-	-	-	-	-	-	-
CO.3	3	3	3	-	-	-	-	-	-	-	-	-
CO.4	3	3	3	-	-	-	-	-	-	-	-	-
CO.5	3	3	3	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-

II B.Tech. - III Semester

23ESC231T	ANALOG CIRCUITS	L	T	P	C
		2	1	0	3

PRE-REQUISITES: A course on Basic Electronics Engineering.

COURSE EDUCATIONAL OBJECTIVES:

1. Understand the concepts of diode clipping and clamping circuits, different amplifier configurations, operation of oscillator circuits, operational amplifiers, timers, ADC and DAC.
2. Apply the above concepts for different circuit design
3. Analyse various circuit characteristics by using Amplifiers, Transistors, Comparators, Wave form generators, ADC and DAC
4. Analyse various circuit characteristics by using timers, Phase locked loops and operational amplifiers
5. Evaluate different system configurations by using various amplifier, transistor and waveform generators

UNIT I: DIODE CIRCUITS AND DC BIASING OF BJTS (9)

Diode clipping and clamping circuits: Diode clippers, clipping at two independent levels, Transfer characteristics of clippers, clamping circuit operation.

DC biasing of BJTs: Load lines, Operating Point, Bias Stability, Collector-to-Base Bias, Self Bias, Stabilization against Variations in VBE and β for the Self-Bias Circuit, Bias Compensation, Thermal Runaway, Thermal Stability

UNIT II: SMALL SIGNALS MODELING OF BJT AND FEEDBACK AMPLIFIERS (9)

Small Signals Modeling of BJT: Analysis of a Transistor Amplifier Circuit using h-parameters, Simplified CE Hybrid Model, Analysis of CE, CC, CB Configuration using Approximate Model.

Feedback Amplifiers: Classification of Amplifiers, the Feedback Concept, General Characteristics of Negative-Feedback Amplifiers, Feedback topologies- Voltage-Series Feedback, Current-Series Feedback, Current-Shunt Feedback, Voltage-Shunt Feedback.

UNIT III: OPERATIONAL AMPLIFIERS AND OSCILLATOR CIRCUIT (9)

Operational Amplifiers: Introduction, Basic information of Op-Amp, Ideal Operational Amplifier, Block Diagram Representation of Typical Op-Amp, OP-Amps Characteristics: 741 op-amp & its features.

Oscillator Circuits: Barkhausen Criterion of oscillation, Oscillator operation, R-C phase shift oscillator, Wien bridge Oscillator

UNIT IV: OP-AMPS APPLICATIONS (9)

Introduction, Basic Op-Amp Applications, Instrumentation Amplifier, V to I and I to V Converter, Log and Antilog Amplifier, Differentiator, integrator.

Comparators and Waveform Generators: Introduction, Comparator, Square Wave Generator, Monostable Multivibrator, Triangular Wave Generator, Sine Wave Generators.

UNIT V: Timers and Phase Locked Loop (9)

Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger, PLL block schematic, principles and description of individual blocks, 565 PLL, Applications of VCO (566).

Digital To Analog and Analog to Digital Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, A-D Converters, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand the basics of diode circuits and DC Biasing of BJTs	**PO1,PO2,PO3**
CO2	Analyze the small signal models and feedback amplifiers using BJT.	**PO1,PO2,PO3**
CO3	Understand the basics of Op-Amp and Its applications as Oscillators.	**PO1,PO2,PO3**
CO4	Analyze and design the Linear circuits using Op-Amp	**PO1,PO2,PO3**
CO5	Understand and analyze the basics of IC 555 timer	**PO1,PO2,PO3**

TEXT BOOKS:

1. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, 8th Edition McGraw Hill, 2013
2. Fundamentals of Electric Circuits, Charles K. Alexander, Mathew N. O. Sadiku, 3RdEdition, Tata McGraw-Hill, 2019

REFERENCE BOOKS:

1. Network Analysis, M. E. Van Valkenburg, 3rd Edition, PHI, 2019.
2. Network Theory, N. C. Jagan and C. Lakshminarayana, 1st Edition, B. S. Publications, 2012.
3. Circuits and Networks Analysis and Synthesis, A. Sudhakar, Shyam Mohan S. Palli, 5th Edition, Tata McGraw-Hill, 2017.
4. Engineering Network Analysis and Filter Design (Including Synthesis of One Port Networks)- Durgesh C. Kulshreshtha Gopal G. Bhise, Prem R. Chadha, Umesh Publications 2012.

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/117/106/117106108/
2. https://archive.nptel.ac.in/courses/108/105/108105159/

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	-	-	-	-	-	-	-	-	-	-
CO.2	3	3	-	-	-	-	-	-	-	-	-	-
CO.3	3	3	-	-	-	-	-	-	-	-	-	-
CO.4	3	3	2	-	-	-	-	-	-	-	-	-
CO.5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-

23EEE231T	DC MACHINES AND TRANSFORMERS	L	T	P	C
		2	1	0	3

PRE-REQUISITE: A course on Basic Electrical Engineering

COURSE EDUCATIONAL OBJECTIVES:

1. Understand the process of voltage build-up in DC generators and characteristics.
2. Understand the process of torque production, starting and speed control of DC motors and illustrate their characteristics.
3. Obtain the equivalent circuit of single-phase transformer, auto transformer and determine its efficiency & regulation.
4. Apply various testing methods for transformers and speed control of DC motors
5. Analyze various configurations of three-phase transformers.

UNIT-I: DC GENERATORS: (9)

Construction and principle of operation of DC machines – EMF equation for generator – Excitation techniques– characteristics of DC generators –applications of DC Generators, Back-emf and torque equations of DC motor – Armature reaction and commutation, Applications.

UNIT-II: STARTING, SPEED CONTROL AND TESTING OF DC MACHINES: (9)

Characteristics of DC motors – losses and efficiency – applications of DC motors. Necessity of a starter – starting by 3-point and 4-point starters – speed control by armature voltage and field current control – testing of DC machines – brake test, Swinburne's test – Hopkinson's test–Field Test.

UNIT-III: SINGLE-PHASE TRANSFORMERS: (9)

Introduction to single-phase Transformers (Construction and principle of operation) – emf equation – operation on no-load and on load –lagging, leading and unity power factors loads –phasor diagrams– equivalent circuit – regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency, Applications

UNIT-IV: TESTING OF TRANSFORMERS: (9)

Open Circuit and Short Circuit tests – Sumpner's test – separation of losses–– Parallel operation with equal and unequal voltage ratios – auto transformer – equivalent circuit – comparison with two winding transformers.

UNIT-V: THREE-PHASE TRANSFORMERS: (9)

Polyphase connections- Y/Y, Y/Δ, Δ/Y, Δ/Δ, open Δ and Vector groups – third harmonics in phase voltages – Parallel operation– three winding transformers- transients in switching – off load and on load tap changers – Scott connection.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understood the concepts of DC generators and characteristics.	**PO1,PO2**
CO2	Understood the process of torque production, starting and speed control of DC motors and illustrate their characteristics.	**PO1,PO2**
CO3	Obtained the equivalent circuit of single-phase transformer, auto transformer and determine its efficiency & regulation.	**PO1,PO2, PO3**
CO4	Applied the various testing methods for transformers and speed control of DC motors	**PO1,PO2**
CO5	Analyzed various configurations of three-phase transformers.	**PO1,PO2,PO3**

TEXT BOOKS:

1. Dr. P S Bimbhra "Electrical Machinery", 7th edition, Khanna Publishers, New Delhi,1995.
2. M.G. Say "Performance and analysis of AC machines", CBS, 2002.

REFERENCE BOOKS:

1. D. P.Kothari, I .J .Nagarth "Electrical Machines", McGraw Hill Publications, 5th edition
2. Stephen J Chapman "Electrical Machinery Fundamentals" McGraw Hill education 2011.
3. Dr. P S Bimbhra "Generalized Theory of Electrical Machines", 7th Edition, Khanna Publishers, 2021.
4. J.B.Gupta, S.K.Kataria & Sons "Theory & Performance of Electrical Machines",2007.
5. Fitzgerald, A.E., Kingsley, Jr., C., & Umans, S. D "Electric Machinery", 7th edition, McGraw-Hill Education, 2014.

REFERENCE WEBSITE:

1. nptel.ac.in/courses/108/105/108105112
2. nptel.ac.in/courses/108/105/108105155

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3										
CO.2	3	3										
CO.3	3	3	2									
CO.4	3	3										
CO.5	3	3	2									
CO*	3	3	2									

23EEE232T	ELECTROMAGNETIC FIELD THEORY	L	T	P	C
		2	1	0	3

PRE-REQUISITE: A course on Electrical circuit Analysis

COURSE EDUCATIONAL OBJECTIVES:

1. Remember the concepts of vector algebra, vector calculus, various fundamental laws, self and mutual inductance.
2. Understand the concepts of electrostatics, conductors, dielectrics, capacitance, magneto statics, magnetic fields, time varying fields, self and mutual inductances
3. Apply vector calculus, Coulomb's law, Gauss's law, Ohm's law in point form, Biot-Savart's law, Ampere's circuital law, Maxwell's third equation, self and mutual inductances, Faraday's laws, Maxwell's fourth equation, Poynting theorem to solve various numerical problems.
4. Analyze vector calculus, electrostatic fields, behavior of conductor in electric filed, BiotSavart's law and its applications
5. Analyze magnetic force, moving charges in a magnetic field, self-inductance of different cables, mutual inductance between different wires and time varying fields

UNIT-I: VECTOR ANALYSIS: (9)

Vector Algebra: Scalars and Vectors, Unit vector, Vector addition and subtraction, Position and distance vectors, Vector multiplication, Components of a vector.
Coordinate Systems: Rectangular, Cylindrical and Spherical coordinate systems.
Vector Calculus: Differential length, Area and Volume. Del operator, Gradient of a scalar, Divergence of a vector and Divergence theorem (definition only). Curl of a vector and Stoke's theorem (definition only), Laplacian of a scalar.
Electrostatics:
Coulomb's law and Electric field intensity (EFI) – EFI due to Continuous charge distributions (line and surface charge), Electric flux density, Gauss's law (Maxwell's first equation, $\nabla.\vec{D} = \rho_v$), Applications of Gauss's law, Electric Potential, Work done in moving a point charge in an electrostatic field (second Maxwell's equation for static electric fields, $\nabla\times E = \vec{0}$), Potential gradient, Laplace's and Poison's equations.

UNIT-II: CONDUCTORS – DIELECTRICS AND CAPACITANCE: (9)

Behavior of conductor in Electric field, Electric dipole and dipole moment – Potential and EFI due to an electric dipole, Torque on an Electric dipole placed in an electric field, Current density conduction and convection current densities, Ohm's law in point form, Behavior of conductors in an electric field, Polarization, dielectric constant and strength, Continuity equation and relaxation time, Boundary conditions between conductor to dielectric, dielectric to dielectric and conductor to free space, Capacitance of parallel plate, coaxial and spherical capacitors, Energy stored and density in a static electric field, Coupled and decoupled capacitors.

UNIT-III: MAGNETO STATICS, AMPERE'S LAW AND FORCE IN MAGNETIC FIELD (9)

Biot-Savart's law and its applications viz. Straight current carrying filament, circular, square, rectangle and solenoid current carrying wire – Magnetic flux density and Maxwell's second

Equation ($\nabla.\vec{B}=0$), Ampere's circuital law and its applications viz. MFI due to an infinite sheet, long filament, solenoid, toroidal current carrying conductor, point form of Ampere's circuital law, Maxwell's third equation ($\nabla\times\vec{H}=\vec{J}$).
Magnetic force, moving charges in a magnetic field – Lorentz force equation, force on a current element in a magnetic field, force on a straight and a long current carrying conductor in a magnetic field, force between two straight long and parallel current carrying conductors, Magnetic dipole, Magnetic torque, and moment.

UNIT-IV: SELF AND MUTUAL INDUCTANCE: (9)

Self and mutual inductance – determination of self-inductance of a solenoid, toroid, coaxial cable and mutual inductance between a straight long wire and a square loop wire in the same plane – Energy stored and energy density in a magnetic field.

UNIT-V: TIME VARYING FIELDS: (9)

Faraday's laws of electromagnetic induction, Maxwell's fourth equation ($\nabla\times\vec{E} = -\partial\vec{B}/\partial t$), integral and point forms of Maxwell's equations, statically and dynamically induced EMF, Displacement current, Modification of Maxwell's equations for time varying fields, Poynting theorem and Poynting vector.

COURSE OUTCOMES:

On successful completion of the course, students Understood the Concept of		POs related to COs
CO1	vector algebra, vector calculus, various fundamental laws, self and mutual inductance	**PO1,PO2**
CO2	electrostatics, conductors, dielectrics, capacitance, magneto statics, magnetic fields, time varying fields, self and mutual inductances	**PO1,PO2**
CO3	Magneto statics, Ampere's Law and Force in magnetic fields	**PO1,PO2, PO3**
CO4	vector calculus, electrostatic fields, behavior of conductor in electric filed, Biot-Savart's law and its applications	**PO1,PO2**
CO5	Magnetic force, moving charges in a magnetic field, self-inductance of different cables, mutual inductance between different wires and time varying fields	**PO1,PO2,PO3**

TEXT BOOKS:

1. Matthew N O Sadiku "Elements of Electromagnetics" Oxford Publications,7th edition, 2018.
2. William H. Hayt & John. A. Buck "Engineering Electromagnetics" Mc. Graw-Hill,7th Editon.2006.

REFERENCE BOOKS:

1. D J Griffiths "Introduction to Electro Dynamics" ,Prentice-Hall of India Pvt. Ltd2nd edition.
2. Yaduvir Singh "Electromagnetic Field Theory", Pearson India, 1st edition, 2011.
3. Sunil Bhooshan "Fundamentals of Engineering Electromagnetics", Oxford University Press, 2012.
4. Joseph A. Edminister, Mahamood Navi Schaum's Outline of Electromagnetics,4th Edition,2014.

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/108/106/108106073/
2. https://nptel.ac.in/courses/117103065

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3										
CO.2	3	3										
CO.3	3	3	2									
CO.4	3	3										
CO.5	3	3	2									
CO*	3	3	2									

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
NBA ACCREDITED

II B.Tech. - III Semester

23EEE233T	NETWORK THEORY	L	T	P	C
		2	1	0	3

PRE-REQUISITE: A course on Electrical circuit Analysis

COURSE EDUCATIONAL OBJECTIVES:

1. Remember the concepts of Laplace transforms, formulation of various circuit topologies (R, L and C components) and basic filters.
2. Understand three phase balanced and unbalanced circuits, different circuit configurations and it's mathematical modeling, network parameters and various filters
3. Apply Laplace transforms to solve various electrical network topologies and filter design concepts various numerical problems.
4. Analyze three phase circuits, transient response of various network topologies, electric circuits with periodic excitations and filter characteristics
5. Design suitable electrical circuits and various filters for different applications.

UNIT-I: ANALYSIS OF THREE PHASE BALANCED AND UNBALANCED CIRCUITS: **(9)**

Balanced circuits:
Phase sequence, star and delta connection of sources and loads, relation between line and phase quantities, analysis of balanced three phase circuits, measurement of active and reactive power.
Unbalanced circuits:
Loop method, Star-Delta transformation technique, two-wattmeter method for measurement of three phase power.

UNIT-II: LAPLACE TRANSFORMS AND TRANSIENT ANALYSIS: **(9)**

Laplace transforms – Definition and Laplace transforms of standard functions– Shifting theorem – Transforms of derivatives and integrals, Inverse Laplace transforms and applications.

Transient Analysis: Transient response of R-L, R-C and R-L-C circuits (Series and parallel combinations) for D.C. and sinusoidal excitations – Initial conditions - Solution using differential equation approach and Laplace transform approach.

UNIT-III: NETWORK PARAMETERS: **(9)**

Impedance parameters, Admittance parameters, Hybrid parameters, Transmission (ABCD) parameters, conversion of Parameters from one form to other, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations- problems.

UNIT-IV: ANALYSIS OF ELECTRIC CIRCUITS WITH PERIODIC EXCITATION: **(9)**

Fourier series and evaluation of Fourier coefficients, Trigonometric and complex Fourier series for periodic waveforms, Application to Electrical Systems – Effective value and average value of non-sinusoidal periodic waveforms, power factor, effect of harmonics.

UNIT-V: FILTERS: **(9)**

Classification of filters-Low pass, High pass, Band pass and Band Elimination filters, Constant-k filters -Low pass and High Pass, Design of Filters

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Remembered the concepts of Laplace transforms, formulation of various circuit topologies (R, L and C components) and basic filters	**PO1,PO2**
CO2	Understood the three-phase balanced and unbalanced circuits, different circuit configurations and it's mathematical modeling, network parameters and various filters	**PO1,PO2**
CO3	Applied the Laplace transforms to solve various electrical network topologies and filter design concepts	**PO1,PO2, PO3**
CO4	Analyzed three phase circuits, transient response of various network topologies, electric circuits with periodic excitations and filter characteristics	**PO1,PO2**
CO5	Analyzed the suitable electrical circuits and various filters for different applications	**PO1,PO2,PO3**

TEXT BOOKS:

1. William Hayt and Jack E. Kemmerly "Engineering Circuit Analysis", , 8th Edition McGraw-Hill, 2013
2. Charles K. Alexander, Mathew N. O. Sadiku "Fundamentals of Electric Circuits", , 3rd Edition, Tata McGraw-Hill, 2019

REFERENCE BOOKS:

1. M. E. Van Valkenburg "Network Analysis", , 3rd Edition, PHI, 2019.
2. N. C. Jagan and C. Lakshminarayana "Network Theory", , 1st Edition, B. S. Publications, 2012.
3. A. Sudhakar, Shyam Mohan S. Palli "Circuits and Networks Analysis and Synthesis", , 5th Edition, Tata McGraw-Hill, 2017.
4. Durgesh C. Kulshreshtha Gopal G. Bhise, Prem R. Chadha "Engineering Network Analysis and Filter Design" (Including Synthesis of One Port Networks)-, Umesh Publications 2012.
5. A. Chakrabarti, Dhanpat Rai & Co "Circuit Theory Analysis and Synthesis", 2018, 7th Revised Edition.

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/117/106/117106108/
2. https://archive.nptel.ac.in/courses/108/105/108105159/

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3										
CO.2	3	3										
CO.3	3	3	2									
CO.4	3	3										
CO.5	3	3	2									
CO*	3	3	2									

II B.Tech. - III Semester

23EEE234L	DC MACHINES AND TRANSFORMERS LAB	L	T	P	C
		0	0	3	1.5

PRE-REQUISITE: A course on Basic Electrical Engineering Lab

COURSE EDUCATIONAL OBJECTIVES:

1. Demonstrate starting and speed control methods of DC Machines.
2. Apply theoretical concepts to determine the performance characteristics of DC Machines.
3. Analyze the parallel operation of single-phase transformers.
4. Determine the performance parameters of single-phase transformer.
5. Analyze the performance analysis of transformers using various tests

LIST OF EXPERIMENTS:

Any 10 of the following experiments are to be conducted:

1. Speed control of DC shunt motor by Field Current and Armature Voltage Control.
2. Brake test on DC shunt motor- Determination of performance curves.
3. Swinburne's test - Predetermination of efficiencies as DC Generator and Motor.
4. Hopkinson's test on DC shunt Machines.
5. Load test on DC compound generator-Determination of characteristics.
6. Load test on DC shunt generator-Determination of characteristics.
7. Fields test on DC series machines-Determination of efficiency.
8. Brake test on DC compound motor-Determination of performance curves.
9. OC & SC tests on single phase transformer.
10. Sumpner's test on single phase transformer.
11. Scott connection of transformers.
12. Parallel operation of Single-phase Transformers.
13. Separation of core losses of a single-phase transformer.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Demonstrate the starting and speed control methods of DC Machines	**PO1**
CO2	Analyze the performance characteristics of DC Machines.	**PO2**
CO3	Analyze the parallel operation of single-phase transformers	**PO3**
CO4	Apply basic electrical engineering tools to find the performance parameters of single-phase transformer	**PO5**
CO5	Follow the ethical principles in while doing the exercises.	**PO8**
CO6	Do the exercises effectively as an individual and as a team member in a group	**PO9**
CO7	Communicate verbally among team members and in written form, the understanding about the trade exercises.	**PO10**
CO8	Continue updating their skill related to trades.	**PO12**

TEXT BOOKS:

1. Dr. P S Bimbhra "Electrical Machinery", 7th edition, Khanna Publishers, New Delhi,1995.
2. M.G. Say, "Performance and analysis of AC machines" CBS, 2002.

REFERENCE:

1. https://ems-iitr.vlabs.ac.in/List%20of%20experiments.html

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

23EEE235L	NETWORK THEORY AND SIMULATION LAB	L	T	P	C
		0	0	3	1.5

PRE-REQUISITE: A course on Electrical circuit Analysis Lab

COURSE EDUCATIONAL OBJECTIVES:

1 Understand the power calculations in three phase circuits.
2 Analyze the time response of given network.
3 Determination of two port network parameters.
4 Simulate and analyze electrical circuits using software tools
5 Apply various theorems to solve different electrical networks using simulation tools

LIST OF EXPERIMENTS:

Any 10 of the following experiments are to be conducted:

1. Measurement of Active Power and Reactive Power for balanced loads.
2. Measurement of Active Power and Reactive Power for unbalanced loads.
3. Determination of Z and Y parameters.
4. Determination of ABCD and hybrid parameters
5. Verification of Kirchhoff's current law and voltage law using simulation tools.
6. Verification of mesh and nodal analysis using simulation tools.
7. Verification of super position and maximum power transfer theorems using simulation tools.
8. Verification of Reciprocity and Compensation theorems using simulation tools.
9. Verification of Thevenin's and Norton's theorems using simulation tools.
10. Verification of series and parallel resonance using simulation tools.
11. Simulation and analysis of transient response of RL, RC and RLC circuits.
12. Verification of self-inductance and mutual inductance by using simulation tools.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Demonstrate the power calculations in three phase circuits	PO1
CO2	Analyze the time response of given network.	PO2
CO3	Analyze the parallel operation of single-phase transformers	PO3
CO4	Apply basic electrical engineering tools to find the two port network parameters	PO5
CO5	Follow the ethical principles in while doing the exercises.	PO8

CO6	Do the exercises effectively as an individual and as a team member in a group	**PO9**
CO7	Communicate verbally among team members and in written form, the understanding about the trade exercises.	**PO10**
CO8	Continue updating their skill related to trades.	**PO12**

TEXT BOOKS:

1. William Hayt and Jack E. Kemmerly "Engineering Circuit Analysis", , 8th Edition McGraw-Hill, 2013
2. Charles K. Alexander, Mathew N. O. Sadiku "Fundamentals of Electric Circuits", , 3rd Edition, Tata McGraw-Hill, 2019

REFERENCE:

1. https://ems-iitr.vlabs.ac.in/List%20of%20experiments.html

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

II B.Tech. - III Semester

23CSE235L	Python Programming (SKILL ENHANCEMENT COURSE)	L	T	P	C
		0	1	2	2

PRE-REQUISITES: A course on Introduction to Programming

COURSE EDUCATIONAL OBJECTIVES:

1. Introduce core programming concepts of Python programming language.
2. Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries
3. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

UNTI-I:

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions,

Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

SAMPLE EXPERIMENTS:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.

i) Arithmetic Operators
ii) Relational Operators
iii) Assignment Operators
iv) Logical Operators
v) Bit wise Operators
vi) Ternary Operator
vii) Membership Operators
iii) Identity Operators

5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

UNIT-II:

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

SAMPLE EXPERIMENTS:

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list:

    i. addition ii. Insertion iii. slicing

12. Write a program to perform any 5 built-in functions by taking any list.

UNIT-III:

Dictionaries: Creating Dictionary, Accessing and Modifying key: value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple () Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip () Function, Sets, Set Methods, Frozenset.

Sample Experiments:

13. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
14. Write a program to count the number of vowels in a string (No control flow allowed).
15. Write a program to check if a given key exists in a dictionary or not.
16. Write a program to add a new key-value pair to an existing dictionary.
17. Write a program to sum all the items in a given dictionary.

UNIT-IV:

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os. path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

SAMPLE EXPERIMENTS:

18. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.

19. Python program to print each line of a file in reverse order.

20. Python program to compute the number of characters, words and lines in a file.

21. Write a program to create, display, append, insert and reverse the order of the items in the array.

22. Write a program to add, transpose and multiply two matrices.

23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V:

Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

SAMPLE EXPERIMENTS:

24. Python program to check whether a JSON string contains complex object or not.

25. Python Program to demonstrate NumPy arrays creation using array () function.

26. Python program to demonstrate use of ndim, shape, size, dtype.

27. Python program to demonstrate basic slicing, integer and Boolean indexing.

28. Python program to find min, max, sum, cumulative sum of array

29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:

a) Apply head () function to the pandas data frame

b) Perform various data selection operations on Data Frame

30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib.

COURSE OUTCOMES:

On successful completion of this course the students should be able to:		POs relatec to COs
CO1	Learn various problem-solving approaches and ability to identify an appropriate approach to solve the problem	**PO1, PO5 PO2 PO3,**
CO2	Implement conditionals and loops to design the python programming	**PO1, PO5 PO2 PO3,**

CO3	Implement lists, set, tuples and dictionaries to develop python program.	**PO1, PO5 PO2 PO3,**
CO4	Able to modulate the given problem using structural approach of programming	**PO1, PO5 PO2 PO3,**
CO5	Build Python Programs using packages to solve real-time problems.	**PO1, PO2, PO3, PO4, PO5**
CO6	Follow the ethical principles in implementing the programs	**PO8**
CO7	Do experiments effectively as an individual and as a team member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understanding about the experiments.	**PO10**
CO9	Continue updating their skill related to lists, tuples and dictionaries implementing programs in future.	**PO12**

REFERENCE BOOKS:

1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.

2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2ndEdition, Pearson, 2024 3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

REFERENCE WEBSITE:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	2	-	-	-	-	-	-	-
CO2	3	3	3	-	2	-	-	-	-	-	-	-
CO3	3	3	3	-	2	-	-	-	-	-	-	-
CO4	3	3	3	-	2	-	-	-	-	-	-	-
CO5	3	3	3	3	2	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**2**	**-**	**-**	**3**	**3**	**3**		**3**

II B.Tech. - III Semester

23MAC231U	**ENVIRONMENTAL SCIENCE**	**L**	**T**	**P**	**C**
		2	**0**	**0**	**0**

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To recognize nature of environment, atmosphere and natural resources including renewable and non-renewable resources.
2. To understand flow and bio-geo-chemical cycles, ecological pyramids and bio-diversity with its conservation.
3. To identify various causes of pollution and solid waste management and related preventive measures.
4. To evaluate and interpret the rainwater harvesting, watershed management and environmental issues such as ozone layer depletion, greenhouse effect etc.
5. To understand the causes of population explosion, value education and welfare programs.

UNIT - I: INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES (6)

Multidisciplinary nature of environmental studies :(a) Definition, scope and importance. Need for public awareness, (b) Atmosphere: its definition and classification.

Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and nonrenewable energy resources.

UNIT – II: CONCEPT OF ECOSYSTEM AND BIODIVERSITY (6)

Structure and function of an ecosystem: Producers, consumers and decomposers- Energy flow in the ecosystem- Ecological succession- Food chains, food webs and ecological pyramids-Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation: Introduction – Definition: genetic, species and ecosystem diversity-Biogeographical classification of India-Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels- India as a mega-diversity nation-Hot-sports of biodiversity-Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. -Endangered and endemic species of India Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III: ENVIRONMENTAL POLLUTION AND WASTE MANAGEMENT (6)

Environmental Pollution: Definition - Cause, effects and control measures of: - a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. nuclear hazards

Solid waste Management: Causes, effects and control measures of urban and industrial wastes Role of an individual in prevention of pollution. Pollution case studies-Disaster management:

floods, earthquake, cyclone and landslides.

UNIT – IV: SOCIAL ISSUES AND THE ENVIRONMENT (6)

From Unsustainable to Sustainable development: Urban problems related to energy-Water conservation, rain water harvesting, watershed management-Resettlement and rehabilitation of people; its problems and concerns. Case studies -Environmental ethics: Issues and possible solution- Climate change, global warming, acid rain, ozone layer depletion, nuclear accident and holocaust, Case studies- Waste land reclamation, consumerism and waste products,

UNIT – V: HUMAN POPULATION AND THE ENVIRONMENT (6)

Population growth: variation among nations-Population explosion – Family Welfare Programmes-Environment and human health-Human Rights-Value Education-HIV/AIDS. -Women and Child Welfare-Role of Information Technology in Environment and human health - Case Studies.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs related to Cos**
CO1	Grasp multidisciplinary nature of environmental studies, atmosphere and various renewable and non-renewable resources.	**PO1, PO7, PO8**
CO2	Understand flow and bio-geo- chemical cycles, ecological pyramids and biodiversity and with its conservation.	**PO1, PO7, PO8**
CO3	Understand various causes of pollution and solid waste management and related preventive measures.	**PO1, PO7, PO8**
CO4	Gain knowledge on rainwater harvesting, watershed management, environmental issues and waste land reclamation.	**PO1, PO7, PO8**
CO5	Understand population explosion, value education and welfare programmes.	**PO1, PO7, PO8**

TEXT BOOKS:

1. Ferdinand P. Beer, E. Russell Johnston, “Vector Mechanics for Engineers”, Tata McGrawHillEducationPvt., Ltd, 12/e, 2019.
2. ErachBharucha, “Textbook of Environmental Studies for Undergraduate Courses”,

University Grants Commission, 2/e,2013, University Press.
3. Palaniswamy, "Environmental Studies", Pearson Educations.
4. S. AzeemUnisa, "Environmental Studies", Academic Publishing Company.
5. K. RaghavanNambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", SciTech Publications (India) Pvt. Ltd.

REFERENCE BOOKS:

1. DeekshaDave, and E. Sai Baba Reddy, "Textbook of Environmental Science" Cengage Publications.
2. C.P.Kaushik and AnubhaKaushik "Text book of Environmental Studies", New Age International publishers, 4/e,2006.
3. M. Anji Reddy, "Text Book of Environmental Sciences and Technology", BS Publications.
4. J.P. Sharma, "Comprehensive Environmental Studies", Laxmi Publications.
5. J. Glynne Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Printice Hall of India Pvt Ltd.
6. G.R. Chatwal, "A Text book of Environmental Studies", Himalaya Publishing House
7. Gilbert M. Masters, and Wendell P. Ela, "Introduction to Environmental Engineering and Science", Printice Hall of India Pvt Ltd.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/127/105/127105018/
2. https://nptel.ac.in/courses/113/104/113104061/
3. https://nptel.ac.in/courses/120/108/120108005/
4. https://nptel.ac.in/courses/120/108/120108002/

CO-PO MAPPING:

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

II B. TECH IV SEM

		L	T	P	C
23HSM231A	**BUSINESS ENVIRONMENT (Common to All branches of Engineering)**	**2**	**0**	**0**	**2**

PRE - REQUSITES: Nil
COURSE EDUCATIONAL OBJECTIVES:

1. To make students understand about Business Environment
2. To enable student's in knowing the importance of fiscal and monitory policy
3. To facilitate the students in understanding the export policy of the country
4. To Impart knowledge on the functioning and role of WTO
5. To encourage the student in knowing the structure of stock markets

UNIT – I: OVERVIEW OF BUSINESS ENVIRONMENT: (9)

Introduction – meaning Nature, Scope, significance, functions and advantages. **Types**-Internal & External, Micro and Macro. Competitive structure of industries –**Environmental Analysis-** advantages & limitations of environmental analysis

UNIT – II: FISCAL & MONETARY POLICY: (9)

Introduction – Nature, meaning, significance, functions and advantages. **Public Revenues** - Public Expenditure - Evaluation of recent fiscal policy of GOI. **Highlights of Budge**t- Monetary Policy - Demand and Supply of Money –**RBI** -Objectives of monetary and credit policy - Recent trends- Role of Finance Commission

UNIT – III: INDIA'S TRADE POLICY: (9)

Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements -EXIM policy and role of EXIM bank -**Balance of Payments**– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures

UNIT – IV: WORLD TRADE ORGANIZATION: (9)

Introduction – Nature, significance, functions and advantages. **Organization and Structure** - Role and functions of WTO in promoting world trade - **GATT** -Agreements in the Uruguay Round –TRIPS, TRIMS - Disputes Settlement Mechanism - Dumping and Anti-dumping

UNIT – V: MONEY MARKETS AND CAPITAL MARKETS: (9)

Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – **SEBI** – Stock Exchanges -Investor protection and role of SEBI, Introduction to international finance

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, student will be able to		Pos related to Cos
CO1	Understand types of Business Environments and its Importance	**PO1,PO6,**
CO2	Evaluate fiscal and monitory policy	**PO1,PO11**
CO3	Understand India's Trade Policy	**PO1, PO11**
CO4	Develop a personal synthesis and approach for identifying business opportunities	**PO1,PO9,PO10**
CO5	Apply the knowledge of Money markets in future investment	**PO1, PO11**

TEXT BOOKS:

1. Francis Cherunilam, International Business: Text and Cases, Prentice Hall of India.
2. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th Revised Edition.HPH

REFERENCE BOOKS:

1. K. V. Sivayya V. B. M Das, Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.
2. Sundaram Black, International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India.
3. Chari. S. N, International Business, Wiley India.
4. E. Bhattacharya, International Business, Excel Publications, New Delhi.

REFERENCE WEBSITE:

1. https://www.slideshare.net/ShompaDhali/business-environment-53111245
2. https://www.slideshare.net/rbalsells/fiscal-policy-ppt
3. https://www.slideshare.net/aguness/monetary-policy-presentationppt

CO-PO MAPPING:

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

II B. TECH IV SEM

23HSM231B	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (Common to All branches of Engineering)	L	T	P	C
		2	0	0	2

PRE - REQUSITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To make students understand the basic perspectives of managerial economics
2. To inculcate knowledge of analyzing production operations and cost structure.
3. To provide knowledge on forms of business and market structure.
4. To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
5. To provide fundamental skills on accounting and to explain the process of preparing financial statements

UNIT – I: MANAGERIAL ECONOMICS: (9)

Introduction – Nature, meaning, significance, functions, and advantages of Managerial Economics. **Demand-Concept**, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods.

UNIT – II: PRODUCTION AND COST ANALYSIS: (9)

Production Analysis: Introduction – Functions and significance of Production. Production Function– Least cost combination– Short run and Long run Production Function- Isoquants and Isocosts

Cost & Break-Even Analysis: Cost concepts and cost behaviour - Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)

UNIT – III: BUSINESS ORGANIZATIONS AND MARKETS: (9)

Introduction Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. **Types of Markets** - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly-Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies

UNIT – IV: CAPITAL BUDGETING: (9)

Introduction – Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. **Projects** – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (simple problems)

UNIT – V: FINANCIAL ACCOUNTING AND ANALYSIS: (9)

Introduction – Concepts and Conventions- Double-Entry Book keeping, Journal, Ledger, Trial Balance- **Final Accounts** (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). **Introduction to Financial Analysis** - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, student will be able to		Pos
CO1	Demonstrate the basic knowledge of Managerial Economics and demand analysis.	**PO1,PO11**
CO2	Apply the Concept of Production and cost analysis in business decision making	**PO1,PO2,PO4,PO10 ,PO11**
CO3	Classify the forms of business organization and forms of market.	**PO1,PO2,PO11,**
CO4	Analyze the investment alternatives using capital budgeting techniques.	**PO1,PO2,PO4,PO10, PO11**
CO5	Prepare the accounting statements and analyze the financial performance of business entity	**PO1,PO2,PO4,PO10, PO11**

TEXT BOOKS:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2016.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019.

REFERENCE BOOKS:

1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage, 2013.

REFERENCE WEBSITE:

1. https://www.nutshell.com/blog/sales-forecasting-methods
2. https://corporatefinanceinstitute.com/resources/accounting/break-even-analysis/
3. https://archive.nptel.ac.in/courses/110/101/110101149/

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	3	**-**
CO2	3	2	-	3	-	-	-	-	-	3	3	**-**
CO3	3	2	-	-	-	-	-	-	-	-	3	**-**
CO4	3	3	-	3	-	-	-	-	-	3	3	**-**
CO5	3	3	-	3	-	-	-	-	-	3	3	**-**
CO*	**3**	**2.5**	**-**	**3**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**

II B. TECH IV SEM

23HSM231B	ORGANISATIONAL BEHAVIOUR (Common to All branches of Engineering)	L	T	P	C
		2	0	0	2

PRE - REQUSITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To enable student's comprehension of organizational behavior
2. To offer knowledge to students on self-motivation and management
3. To facilitate the students to become powerful leaders
4. To impart knowledge about group dynamics
5. To make them understand the importance of change and development

UNIT – I: INTRODUCTION TO ORGANIZATIONAL BEHAVIOR: (8)

Meaning, definition, nature, scope and functions - Organizing Process – Making organizing effective - **Understanding Individual Behaviour** –Attitude -Perception - Learning – Personality

UNIT – II: MOTIVATION: (9)

Theories of Motivation- Maslow's Hierarchy of Needs - Hertzberg's Two Factor Theory - Vroom's theory of expectancy – Mc Cleland's theory of needs–Mc Gregor's theory X and theory Y– Adam's equity theory.

UNIT – III: ORGANIZATIONAL CLIMATE AND LEADERSHIP: (9)

Introduction – Meaning, scope, definition, Nature - **Organizational Climate** - **Leadership** - Traits Theory–Managerial Grid - Transactional Vs Transformational Leadership – Qualities of good Leader - Conflict Management -Evaluating Leader.

UNIT – IV: GROUP DYNAMICS: (10)

Introduction – Meaning, scope, definition, Nature- Types of groups - **Determinants of group behaviour** - Group process – Group Development - Group norms - Group cohesiveness - Small Groups - Group decision making - **Team building** - Conflict in the organization– Conflict resolution.

UNIT – V: ORGANIZATIONAL CHANGE AND DEVELOPMENT: (9)

Introduction –Nature, Meaning, scope, definition and functions- **Organizational Culture** - Changing the Culture – Change Management – Work Stress Management – Organizational management – Managerial implications of organization's change and development.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, student will be able to		Pos
CO1	Understand the nature and concept of Organizational behavior	**PO1,PO8,PO9, PO10,PO11,PO12**
CO2	Apply theories of motivation to analyze the performance problems	**PO1, PO8,PO9, PO10**
CO3	Analyze the different theories of leadership	**PO1,PO9,PO11,**
CO4	Evaluate group dynamics	**PO1,PO9,PO10, PO11**
CO5	Analyze organizational dynamics and readiness	**PO1,PO9, PO12**

TEXT BOOKS:

1. Essentials of Management, 10/e., 2008, Koontz, H and,Weihrich, H, McGraw-Hill, New York.
2. Organizational Behavior, 15/e, 2013, Stephen P. Robbins, Pearson Education, San Diego

REFERENCE BOOKS:

1. Organizational Behaviour, 12 /e, 2010, Fred Luthans, Tata McGrawHill, New Delhi.
2. Organizational Behaviour, 15/e, 2012, Robbins, SP, Prentice Hall of India, New Delhi.
3. Management and Organisational Behaviour, 4/e, 2010, Subbarao P, Himalaya Publishing House, New Delhi.

REFERENCE WEBSITE:

1. https://www.geeksforgeeks.org/introduction-to-business-management/
2. http://www.mim.ac.mw/books/Management%20&%20Organizational%20Behaviour,%207th%20edition.pdf
3. https://ccsuniversity.ac.in/bridge-library/pdf/Main-principles%20of%20Management%20and%20Organisational%20Behaviour.pdf
4. https://www.ripublication.com/gjfm-spl/gjfmv6n6_12.pdf

CO-PO MAPPING

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	3	2	3	3	3
CO2	3	-	-	-	-	-	-	2	3	3	-	-
CO3	3	-	-	-	-	-	-	-	3	3	-	-
CO4	3	-	-	-	-	-	-	-	3	3	3	-
CO5	3	-	-	-	-	-	-	-	2	-	-	3
CO*	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2.5**	**2.6**	**3**	**3**	**3**

II B. TECH IV SEM

23HSM234T	UNIVERSAL HUMAN VALUES UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	L	T	P	C
		2	1	-	3

PRE-REQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

COURSE TOPICS:

- The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1-hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.
- The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT I: INTRODUCTION TO VALUE EDUCATION-6 lectures and 3 tutorials for practice session **(9)**

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself
Lecture 3: self-exploration as the Process for Value Education
Lecture4: Continuous Happiness and Prosperity –the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT II: HARMONY IN THE HUMAN BEING- 6 lectures and 3 tutorials for practice session **(9)**

Lecture 7: Understanding Human being as the Co-existence of the self and the body.
Lecture 8: Distinguishing between the Needs of the self and the body Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self
Lecture 10: Understanding Harmony in the self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self

Lecture 11: Harmony of the self with the body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III HARMONY IN THE FAMILY AND SOCIETY 6 lectures and 3 tutorials for practice session **(9)**

Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT IV HARMONY IN THE NATURE/EXISTENCE - 4 lectures and 2 tutorials for practice session **(9)**

Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence

UNIT V IMPLICATIONS OF THE HOLISTIC UNDERSTANDING (9)

Lecture 23:Natural Acceptance of Human Values Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order.

TOTAL HOURS: 45

Practice Sessions for UNIT I – Introduction to Value Education

PS1 Sharing about Oneself
PS2 Exploring Human Consciousness
PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being

PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self
PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence) PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

MODE OF CONDUCT:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.
Tutorial hours are to be used for practice sessions.
While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.
In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self- reflection and self-exploration.
Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.
Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.
It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department.
Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Define the terms like Natural Acceptance, Happiness and Prosperity	**PO1,PO2**
CO2	Identify one's self, and one's surroundings (family, society nature)	**PO1,PO2**

CO3	Apply what they have learnt to their own self in different day-to-day settings in real life	**PO1,PO2,PO3**
CO4	Relate human values with human relationship and human society.	**PO1,PO2**
CO5	Justify the need for universal human values and harmonious existence	**PO1,PO2,PO3**

TEXTBOOKS:

Textbook

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

Teacher's Manual

1. R R Gaur, R Asthana, G P Bagaria, Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCE BOOKS:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

REFERNCE WEBSITE:

1. **https://fdp-si.aicte-india.org/UHV-**II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. **https://fdp-si.aicte-india.org/UHV-**II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. **https://fdp-si.aicte-india.org/UHV-**II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. -**https://fdp-si.aicte-india.org/UHV%201%20Teaching%204Material/D3-**S2%20Respect%20July%2023.pdf
5. **https://fdp-si.aicte-india.org/UHV-**II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	-
CO.2	3	-	-	-	-	-	-	-	-	-	-	-
CO.3	3	2	2	-	-	-	-	-	-	-	-	-
CO.4	3	-	-	-	-	-	-	-	-	-	-	-
CO.5	3	2	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**2**	-	-	-	-	-	-	-	-	-

23EEE241T	CONTROL SYSTEM	L	T	P	C
		2	1	0	3

PRE-REQUISITE: A course on Electrical circuit Analysis-I

COURSE EDUCATIONAL OBJECTIVES:

1. Understand the concepts of various mathematical representations of control systems, Time response of first order and second order systems, stability, frequency response and fundamentals of modern control systems
2. Apply Block diagram reduction, Signal flow graph, Routh criterion, Root locus, Bode, Polar,
3. Nyquist concepts for solving various numerical problems
4. Analyze time response characteristics, frequency response characteristics, stability analysis of various control systems
5. Design various compensators and controllers for different control systems by using design procedures and Create suitable control systems for various real time applications.

UNIT I: CONTROL SYSTEMS CONCEPTS (9)

Open loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models – Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods – Signal flow graphs - Reduction using Mason's gain formula. Principle of operation of DC and AC Servo motor, Transfer function of DC servo motor - AC servo motor, Synchros.

UNIT II: TIME RESPONSE ANALYSIS (9)

Step Response - Impulse Response - 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, P, PI, PID Controllers.

UNIT III STABILITY ANALYSIS IN TIME DOMAIN (9)

The concept of stability – Routh's stability criterion – Stability and conditional stability – limitations of Routh's stability. The Root locus concept - construction of root loci-effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT IV FREQUENCY RESPONSE ANALYSIS (9)

Introduction, Frequency domain specifications-Bode Diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain Margin-Stability Analysis.
Compensation techniques – Lag, Lead, Lag-Lead Compensator design in frequency Domain.

UNIT V STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS (9)

Concepts of state, state variables and state model, state models - differential equations &

Transfer function models - Block diagrams. Diagonalization, Transfer function from state model, Solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models. The concepts of controllability and observability, Duality between controllability and observability.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understand the construction, principle and operation of single phase and three phase induction motors	**PO1,PO2**
CO2	Understand the construction, principle and operation of synchronous generator and synchronous motor	**PO1,PO2**
CO3	Understand various applications of various alternating machines	**PO1,PO2,PO3**
CO4	Apply the above concepts to solve various mathematical and complex problems	**PO1,PO2**
CO5	Analyze the characteristics of induction motor, synchronous motor and synchronous generators	**PO1,PO2,PO3**

TEXTBOOKS:

1. Modern Control Engineering by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. Control Systems Engineering by I. J. Nagrath and M. Gopal, New Age International (P) Limited Publishers, 5th edition, 2007.

REFERENCE BOOKS:

1. Control Systems Principles & Design by M.Gopal, 4th Edition, Mc Graw Hill Education, 2012.
2. Automatic Control Systems by B. C. Kuo and Farid Golnaraghi, John wiley and sons, 8th edition, 2003.
3. Feedback and Control Systems, Joseph J Distefano III, Allen R Stubberud & Ivan J Williams, 2nd Edition, Schaum's outlines, Mc Graw Hill Education, 2013.
4. Feedback Control of Dynamic Systems by Gene F. Franklin, J.D. Powell and Abbas Emami-Naeini, 6th Edition, Pearson, 2010.

REFERNCE WEBSITE:

1. https://nptel.ac.in/courses/108102043
2. https://nptel.ac.in/courses/108106098.

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3											
CO.2	3											
CO.3	3	2										
CO.4	3											
CO.5	3	2										
CO*	3	2										

II B. TECH IV SEM

23EEE242T	INDUCTION AND SYNCHRONOUS MACHINES	L	T	P	C
		2	1	0	3

PRE-REQUISITE: A course on DC Machines and Transformers.

COURSE EDUCATIONAL OBJECTIVES:

1. Understand the construction, principle and operation of single phase and three phase induction motors
2. Understand the construction, principle and operation of synchronous generator and synchronous motor
3. Understand various applications of various alternating machines
4. Apply the above concepts to solve various mathematical and complex problems
5. Analyze the characteristics of induction motor, synchronous motor and synchronous generators

UNIT-I: 3-PHASE INDUCTION MOTORS: (9)

Construction of Squirrel cage and Slipring induction motors– production of rotating magnetic field – principle of operation – rotor emf and rotor frequency – rotor current and power factor at standstill and during running conditions– rotor power input, rotor copper loss and mechanical power developed and their inter-relationship –equivalent circuit – phasor diagram, Applications.

UNIT-II: PERFORMANCE OF 3-PHASE INDUCTION MOTORS: (9)

Torque equation – expressions for maximum torque and starting torque – torque-slip characteristics – double cage and deep bar rotors – No load, Brake test and Blocked rotor tests – circle diagram for predetermination of performance- methods of starting –starting current and torque calculations - speed control of induction motor with V/f control method, rotor resistance control and rotor emf injection technique –crawling and cogging – induction generator operation.

UNIT-III: SINGLE PHASE MOTORS: (9)

Single phase induction motors – constructional features – double revolving field theory, Cross field theory – equivalent circuit- starting methods: capacitor start capacitor run, capacitor start induction run, split phase & shaded pole, AC series motor, Applications.

UNIT-IV: SYNCHRONOUS GENERATOR: (9)

Constructional features of non-salient and salient pole type alternators- armature windings – distributed and concentrated windings – distribution & pitch factors – E.M.F equation – armature reaction – voltage regulation by synchronous impedance method – MMF method and Potier triangle method – two reaction analysis of salient pole machines - methods of synchronization- Slip test – Parallel operation of alternators.

UNIT-V: SYNCHRONOUS MOTOR: (9)

Synchronous motor principle and theory of operation – Effect of excitation on current and power factor– synchronous condenser –expression for power developed –hunting and its suppression – methods of starting, Applications.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understand the construction, principle and operation of single phase and three phase induction motors	**PO1,PO2**
CO2	Understand the construction, principle and operation of synchronous generator and synchronous motor	**PO1,PO2**
CO3	Understand various applications of various alternating machines	**PO1,PO2,PO3**
CO4	Apply the above concepts to solve various mathematical and complex problems	**PO1,PO2**
CO5	Analyze the characteristics of induction motor, synchronous motor and synchronous generators	**PO1,PO2,PO3**

TEXTBOOKS:

1. Electrical Machinery, Dr. P.S. Bhimbra, Khanna Publishing, 2021, First Edition.
2. Performance and analysis of AC machines by M.G. Say, CBS, 2002.

REFERENCE BOOKS:

1. Electrical machines, D.P. Kothari and I.J. Nagrath, McGraw Hill Education, 2017, Fifth Edition.
2. Theory & Performance of Electrical Machines by J.B.Gupta, S.K.Kataria & Sons,2007.
3. Electric Machinery, A.E.Fitzgerald, Charles kingsley, Stephen D.Umans, McGraw-Hill, 2020, Seventh edition.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/108/105/108105131
2. https://nptel.ac.in/courses/108106072

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3											
CO.2	3											
CO.3	3	2										
CO.4	3											
CO.5	3	2										
CO*	3	2										

II B.TECH IV SEM

23EEE243T	POWER SYSTEMS-I	L	T	P	C
		2	1	-	3

PRE-REQUISITE: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. Understand the different types of power plants, operation of power plants
2. Understand the concepts of distribution systems, underground cables, economic aspects and tariff
3. Understand various substations that are located in distribution systems
4. Apply the above concepts to illustrate different power generation layouts
5. Analyze various economic aspects related to power generation and distribution

UNIT-I: HYDROELECTRIC AND THERMAPOWER STATIONS: (9)

Selection of site, general layout of a hydroelectric power plant with brief description of major components and principle of operation Selection of site, general layout of a thermal power plant. Brief description of components: boilers, super heaters, economizers and electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.

UNIT-II: NUCLEAR POWER STATIONS: (9)

Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants, types of nuclear reactors and brief description of PWR, BWR and FBR. Radiation: radiation hazards and shielding, nuclear waste disposal

UNIT-III: SUBSTATIONS: (9)

Air Insulated Substations – indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment. Bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams.

Gas Insulated Substations (GIS) – advantages of gas insulated substations, constructional aspects of GIS, comparison of air insulated substations and gas insulated substations.

UNIT-IV: DISTRIBUTION SYSTEMS: (9)

Classification of Distribution systems, A.C Distribution, overhead versus Underground system, Connection schemes of Distribution system, Requirements of Distribution system, Design considerations in Distribution system.

Underground Cables:

Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable. Capacitance of single and 3-Core belted Cables. Grading of cables: capacitance grading and inter sheath grading.

UNIT-V: ECONOMIC ASPECTS & TARIFF: (9)

Economic Aspects – load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor and plant use factor, base and peak load plants.
Tariff Methods– Costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block-

rate, two part, three–part, and power factor tariff methods, Time of Day (TOD) tariff and Time of Use (TOU) tariff**.**

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs related to COs
CO1	Understood the different types of power plants, operation of power plants	PO1,PO2
CO2	Understood the concepts of distribution systems, underground cables, economic aspects and tariff	PO1,PO2,PO12
CO3	Understood various substations that are located in distribution systems	PO1,PO2,PO3
CO4	Applied the above concepts to illustrate different power generation layouts	PO1,PO2,PO3
CO5	Analyzed various economic aspects related to power generation and distribution	PO1,PO2,PO3, PO12

TEXT BOOKS:

1. S. N. Singh, Electric Power Generation, Transmission and Distribution, PHI Learning Pvt Ltd, New Delhi, 2nd Edition, 2010
2. J. B. Gupta, Transmission and Distribution of Electrical Power, S. K. Kataria and sons,10th Edition, 2012.

REFERENCE BOOKS:

1. J. Nagarath & D.P. Kothari, Power System Engineering, McGraw-Hill Education, 3rd Edition, 2019.
2. C. L. Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International Publishers, 6th Edition, 2018.
3. V. K. Mehta and Rohit Mehta, Principles of Power System, S. Chand, 4th Edition, 2005.
4. Turan Gonen, Electric Power Distribution System Engineering, McGraw-Hill, 1985.
5. Handbook of switchgear, BHEL, McGraw-Hill Education, 2007.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/108102047

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3											
CO.2	3											2
CO.3	3	2										
CO.4	3	2										
CO.5	3	2										2
CO*	**3**	**2**										**2**

II B.TECH IV SEM

23EEE244L	**CONTROL SYSTEMS LAB**	**L T P C**
		0 0 3 1.5

PRE-REQUISITE: A course on Electrical circuit Analysis-I Lab

COURSE EDUCATIONAL OBJECTIVES:

1. Understand how to use feedback control system to determine transfer function of DC servo motor and any other given circuit with R, L and C components
2. Model the systems and able to design the controllers and compensators.
3. Get the knowledge about the effect of poles and zeros location on transient and steady state behavior of second order systems and implement through software tools
4. Determine the performance and time domain specifications of first and second order systems.
5. Understand the stability analysis

LIST OF EXPERIMENTS:

Any 10 of the Following Experiments are to be conducted.

1. Time response of Second order system
2. Characteristics of Synchros
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 feedback on DC servo motor
5. Transfer function of DC Machine
6. Effect of P, PD, PI, PID Controller on a second order system
7. Lag and lead compensation – Magnitude and phase plot
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor
11. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
12. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB
13. State space model for classical transfer function using MATLAB – Verification.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Demonstrate the performance characteristics of 1. feedback control system to determine transfer function of DC servo motor and any other given circuit with R, L and C components	**PO1**
CO2	Analyze the performance of 3-phase Induction Motor by obtaining the circle diagram and equivalent circuit of 3-phase Induction Motor and single-phase induction motor.	**PO2**
CO3	Analyze the design of controllers and compensators	**PO3**

CO4	Apply basic electrical engineering tools to determine the time domain specifications of first and second order systems.	**PO5**
CO5	Follow the ethical principles in while doing the exercises.	**PO8**
CO6	Do the exercises effectively as an individual and as a team member in a group	**PO9**
CO7	Communicate verbally among team members and in written form, the understanding about the trade exercises.	**PO10**
CO8	Continue updating their skill related to trades.	**PO12**

TEXTBOOKS:

1. Katsuhiko Ogata "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. I. J. Nagrath and M. Gopal,"Control Systems Engineering" New Age International (P) Limited Publishers, 5th edition, 2007.

REFERENCE:

https://ems-iitr.vlabs.ac.in/List%20of%20experiments.html

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

II B.TECH IV SEM

		L	T	P	C
23EEE245L	**INDUCTION AND SYNCHRONOUS MACHINES LAB**	**0**	**0**	**3**	**1.5**

PRE-REQUISITE: A course on Electrical circuit Analysis Lab

COURSE EDUCATIONAL OBJECTIVES:

1. Analyze various performance characteristics of 3-phase and 1-phase induction motors
2. Evaluate the performance of 3-phase Induction Motor by obtaining the circle diagram and equivalent circuit of 3-phase Induction Motor and single-phase induction motor
3. Adapt the power factor improvement methods for single phase Induction Motor
4. Pre-determine the regulation of 3-phase alternator
5. Determine the synchronous machine reactance of 3-phase alternator

LIST OF EXPERIMENTS:

Any 10 experiments of the following are required to be conducted

1. Brake test on three phase Induction Motor.
2. Circle diagram of three phase induction motor.
3. Speed control of three phase induction motor by V/f method.
4. Equivalent circuit of single-phase induction motor.
5. Power factor improvement of single-phase induction motor by using capacitors.
6. Load test on single phase induction motor.
7. Regulation of a three -phase alternator by synchronous impedance & MMF methods.
8. Regulation of three-phase alternator by Potier triangle method.
9. V and Inverted V curves of a three-phase synchronous motor.
10. Determination of X_d, X_q & Regulation of a salient pole synchronous generator
11. Determination of efficiency of three phase alternator by loading with three phase induction motor.
12. Parallel operation of three-phase alternator under no-load and load conditions.
13. Determination of efficiency of a single-phase AC series Motor by conducting Brake test.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Demonstrate the performance characteristics of 3-phase and 1-phase induction motors	**PO1**
CO2	Analyze the performance of 3-phase Induction Motor by obtaining the circle diagram and equivalent circuit of 3-phase Induction Motor and single-phase induction motor.	**PO2**
CO3	Analyze the power factor improvement methods for single phase Induction Motor	**PO3**

CO4	Apply basic electrical engineering tools to regulation of 3-phase alternator	**PO5**
CO5	Follow the ethical principles in while doing the exercises.	**PO8**
CO6	Do the exercises effectively as an individual and as a team member in a group	**PO9**
CO7	Communicate verbally among team members and in written form, the understanding about the trade exercises.	**PO10**
CO8	Continue updating their skill related to trades.	**PO12**

TEXT BOOK:

1. Dr. P.S. Bhimbra "Electrical Machinery", , Khanna Publishing, 2021, First Edition.
2. M.G. Say "Performance and analysis of AC machines" , CBS, 2002.

REFERENCE:

1. https://em-coep.vlabs.ac.in/List%20of%20experiments.html

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

II B.TECH IV SEM

23CSE244L	DATA STRUCTURES AND ALGORITHM	L	T	P	C
		0	1	2	2

PRE-REQUISITES: A course on Introduction to Programming

COURSE OBJECTIVES:

1. To provide the knowledge of basic data structures and their implementations.
2. To understand importance of data structures in context of linked list concept.
3. To develop skills to apply appropriate data structures in problem solving using stacks.
4. To understand and implement the data structures using queue concept.
5. To provide knowledge about trees and hashing concepts.

UNIT I Introduction to Data Structures:

Definition and importance of Data structures, Abstract data types (ADTs) and its specifications, **Arrays**: Introduction, 1-D, 2-D Arrays, accessing elements of array, Row Major and Column Major storage of Arrays, **Searching Techniques**: Linear & Binary Search, **Sorting Techniques**: Bubble sort, Selection sort, Quick sort.

Sample experiments:

1. Program to find min & max element in an array.
2. Program to implement matrix multiplication.
3. Find an element in given list of sorted elements in an array using Binary search.
4. Implement Selection and Quick sort techniques.

UNIT II Linked Lists:

Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

Sample experiments:

1. Write a program to implement the following operations.
   i. a. Insert b. Deletion c. Traversal
2. Write a program to store name, roll no, and marks of students in a class using circular double linked list.
3. Write a program to perform addition of given two polynomial expressions using linked list.

UNIT III Stacks:

Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

Sample experiments:

1. Implement stack operations using
   a. Arrays b. Linked list
2. Convert given infix expression into post fix expression using stacks.
3. Evaluate given post fix expression using stack.
4. Write a program to reverse given linked list using stack.

UNIT IV QUEUES AND DEQUES:

Introduction to queues: properties and operations, Circular queues, implementing queues using arrays and linked lists, Applications of queues scheduling, etc.

Deques: Introduction to deques (double-ended queues), Operations on deques and their applications.

Sample experiments:

1. Implement Queue operations using
   a. Arrays b. Linked list
2. Implement Circular Queue using
   a. Arrays b. Linked list
3. Implement Dequeue using linked list.

UNIT V

Trees: Introduction to Trees, Binary trees and traversals, Binary Search Tree – Insertion, Deletion & Traversal

Sample experiments:

1. Implement binary tree traversals using linked list.
2. Write program to create binary search tree for given list of integers. Perform in-order traversal of the tree. Implement insertion and deletion operations.

COURSE OUTCOMES:

On successful completion of the course the student will be		POs related to Cos
CO1	Explain the role of linear data structures in organizing and accessing data efficiently in algorithms	**PO1**
CO2	Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.	**PO2**
CO3	Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems	**PO3**
CO4	Apply queue-based algorithms for efficient solving of relevant problems	**PO4**
CO5	Recognize scenarios where tree -based solutions for specific problems.	**PO5**
CO6	Follow the ethical principles in implementing the programs	**PO8**
CO7	Do experiments effectively as an individual and as a team member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understanding about the experiments.	**PO10**
CO9	Continue updating their skill related to loops, pointers and files, implementing programs in future.	**PO12**

TEXTBOOKS:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, SartajSahni, Susan Anderson-Freed, Silicon Press, 2008

REFERENCE BOOKS:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

23ESC241I	**DESIGN THINKING AND INNOVATION**	**L T P C**
		1 0 2 2

COURSE OBJECTIVES:

The objective of this course is to familiarize students with design thinking process as a tool for breakthrough innovation. It aims to equip students with design thinking skills and ignite the minds to create innovative ideas, develop solutions for real-time problems.

UNIT I INTRODUCTION TO DESIGN THINKING (9)

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT II DESIGN THINKING PROCESS (9)

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT III INNOVATION (9)

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT IV PRODUCT DESIGN (9)

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

UNIT V DESIGN THINKING IN BUSINESS PROCESSES (9)

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining

Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes.

Activity: How to market our own product, About maintenance, Reliability and plan for startup.

COURSE OUTCOMES:

On successful completion of the course the student will be		POs
CO1	Define the concepts related to design thinking.	**PO1**
CO2	Explain the fundamentals of Design Thinking and innovation	**PO2**
CO3	Apply the design thinking techniques for solving problems in various sectors.	**PO3**
CO4	Analyse to work in a multidisciplinary environment	**PO4**
CO5	Evaluate the value of creativity and formulate specific problem statements of real time issues	**PO5**

TEXTBOOKS:

1. Tim Brown,Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

REFERENCE BOOKS:

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell,Universal Principles of Design- Kritinaholden, Jill Butter.
4. Chesbrough.H, The Era of Open Innovation – 2013

REFERENCE LINK:

1. https://nptel.ac.in/courses/110/106/110106124/
2. https://nptel.ac.in/courses/109/104/109104109/
3. https://swayam.gov.in/nd1_noc19_mg60/preview

CO-PO MAPPING:

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

III B.TECH V SEM

23ECE353T	DIGITAL CIRCUITS	L T P C
		2 1 0 3

PRE-REQUISITES: Basic Mathematics

COURSE EDUCATIONAL OBJECTIVES:

1. To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
2. To analyze combinational circuits like adders, subtractors, and code converters.
3. To explore combinational logic circuits and their applications in digital design.
4. To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
5. To gain knowledge about programmable logic devices and digital IC's.

UNIT –1 INTRODUCTION (9)

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT-II INTRODUCTION TO COMBINATIONAL DESIGN 1 (9)

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT-III COMBINATIONAL LOGIC DESIGN 2 (9)

Combinational Logic Design 2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT-IV SEQUENTIAL LOGIC DESIGN (9)

Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT-V PROGRAMMABLE LOGIC DEVICES AND DIGITAL ICs (9)

Programmable Logic Devices: ROM, Programmable Logic Devices (PLA and PAL).

Digital IC's: Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Learn Boolean algebra, logic simplification techniques, and combinational circuit design.	**PO1, PO2**
CO2	Analyze combinational circuits like adders, subtractors, and code converters.	**PO1, PO2, PO3**
CO3	Explore combinational logic circuits and their applications in digital design.	**PO1, PO2, PO3**
CO4	Understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.	**PO1, PO2, PO3**
CO5	Gain knowledge about programmable logic devices and digital IC's.	**PO1, PO2**

TEXT BOOKS:

1. Digital Design, M.Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999.
2. Switching theory and Finite Automata Theory, ZviKohavi and NirahK.Jha, 2nd Edition, Tata McGraw Hill, 2005.

REFERENCE BOOKS:

1. Fundamentals of Logic Design, Charles H Roth,Jr., 5th Edition, Brooks/cole Cengage Learning, 2004.

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/108/105/108105132/
2. https://archive.nptel.ac.in/courses/108/105/108105113/
3. https://archive.nptel.ac.in/content/storage2/courses/106108099/Digital%20Systems.pdf

CO-PO MAPPING

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

III B.TECH V SEM

23EEE351T	POWER ELECTRONICS	L T P C
		2 1 0 3

PRE-REQUISITES: Electronic Devices and Circuits.

COURSE EDUCATIONAL OBJECTIVES:

1. Impart knowledge on Different types of power switching devices and their Switching circuits.
2. Impart knowledge on Operation, characteristics and performance parameters of controlled rectifiers.
3. Impart knowledge on Operation, switching techniques and basics topologies of DC-DC converters.
4. Impart knowledge on Different modulation techniques of pulse width modulated inverters.
5. Impart knowledge on Operation of AC voltage controller and various Cyclo converters.

UNIT –1: POWER SWITCHING DEVICES: (9)

Power Switching Devices: Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; Firing circuit for thyristor; Voltage and current commutation of a thyristor; Gate drive circuits for MOSFET, IGBT and GTO. Introduction to Gallium Nitride and Silicon Carbide Devices.

UNIT –2: RECTIFIERS: (9)

Rectifiers: Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R-load and highly inductive load; Three-phase full-bridge thyristor rectifier with R-load and highly inductive load; Input current wave shape, power factor and effect of source inductance; Analysis of rectifiers with filter capacitance, Dual Converter -Numerical problems.

UNIT –3: DC-DC CONVERTERS (9)

DC-DC Converters: Elementary chopper with an active switch and diode, concepts of duty ratio, control strategies and average output voltage: Power circuit, analysis and waveforms at steady state, duty ratio control and average output voltage of Buck, Boost and Buck- Boost
converters.

UNIT –4: INVERTERS: (9)

Single phase Voltage Source inverters – operating principle - steady state analysis, Simple forced commutation circuits for bridge inverters – Voltage control techniques for inverters and Pulse width modulation techniques, single phase current source inverter with ideal switches, basic series inverter, single phase parallel inverter – basic principle of operation only, Three phase bridge inverters (VSI) – 180degree mode – 120degree mode of operation Numerical problems.

UNIT –5: AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS: (9)

AC voltage controllers – Principle of phase control – Principle of integral cycle control - Single phase two SCRs in anti-parallel – With R and RL loads – modes of operation of Triac –Triac with R and RL loads –RMS load voltage, current and power factor - wave forms – Numerical problems. Cyclo converters – Midpoint and Bridge connections - Single phase to single phase step-up and step-down cyclo converters with Resistive and inductive load, Principle of operation, Waveforms, output voltage equation.

UNIT –5: AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS: (9)

AC voltage controllers – Principle of phase control – Principle of integral cycle control - Single phase two SCRs in anti-parallel – With R and RL loads – modes of operation of Triac –Triac with R and RL loads –RMS load voltage, current and power factor - wave forms – Numerical problems. Cyclo converters – Midpoint and Bridge connections - Single phase to single phase step-up and step-down cyclo converters with Resistive and inductive load, Principle of operation, Waveforms, output voltage equation.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand the I-V Characteristics and Gate Drive Requirements of Power Devices Including Diodes, Thyristors, MOSFETs, and IGBTs	**PO1, PO2**
CO2	Design Single-Phase and Three-Phase Rectifiers with Different Load Conditions and Evaluate Power Factor and Source Inductance Effects	**PO1, PO2, P03**
CO3	Apply Duty Ratio Control and Analyze Steady-State Waveforms of Buck, Boost, and Buck Boost Converters	**PO1, PO2, P03,PO4,PO5**
CO4	Analyze the Operation of Inverters, AC Voltage Controllers, and Cyclo Converters with Various Load Conditions and Commutation Techniques	**PO1, PO2, P03, PO4**
CO5	Explore advanced power electronic devices like GaN and SiC, understanding their applications in modern power systems	**PO1, PO2, P03,PO4,PO5**

TEXT BOOKS:

1. M. H. Rashid, ―Power Electronics: Circuits, Devices and Applications‖, 2nd edition, Prentice Hall of India, 1998.
2. P.S. Bimbhra, ―Power Electronics‖, 4th Edition, Khanna Publishers, 2010.
3. M. D. Singh & K. B. Kanchandhani, ―Power Electronics‖, Tata Mc Graw Hill Publishing Company,

REFERENCE BOOKS:

1. Ned Mohan, ―Power Electronics‖, Wiley, 2011.
2. Robert W. Erickson and Dragan Maksimovic, ―Fundamentals of Power Electronics‖ 2nd Edition,Kluwer Academic Publishers, 2004.
3. Vedam Subramanyam, ―Power Electronics‖, New Age International (P) Limited, 1996.
4. V. R. Murthy, ―Power Electronics‖, 1st Edition, Oxford University Press, 2005.

5. P. C. Sen, ―Power Electronics‖, Tata Mc Graw-Hill Education, 1987.
6. J. M. D. Murphy ―Power Electronic Control of Alternating Current Motors‖.

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/108/102/108102145/

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	3	-
CO2	2	2	3	-	-	-	-	-	-	-	3	-
CO3	3	3	3	3	3	-	-	-	-	-	3	-
CO4	2	2	3	3		-	-	-	-	-	3	-
CO5	2	2	3	3	3	-	-	-	-	-	3	-
CO*	**2.4**	**2.4**	**3**	**3**	**3**	**-**	**-**	-	-	-	3	**3**

III B.TECH V SEM

23EEE352T	POWER SYSTEMS-II	L T P C
		2 1 0 3

PRE-REQUISITES:

COURSE EDUCATIONAL OBJECTIVES:

1. To study about line parameters and constants
2. To study the performance of transmission lines
3. To know about overhead line insulators, corona, sag and tension in transmission lines
4. To study about symmetrical components and different types of faults in power system.
5. To understand the concept of voltage control, compensation methods

UNIT –1: Transmission line parameters: (9)

Types of Conductors - Calculation of Resistance for Solid Conductors, Bundle Conductors, Skin effect, Proximity effect, Concept of GMR & GMD- Transposition of Power lines- Calculation of inductance for single phase and three phase, Single and Double circuit lines, Symmetrical and asymmetrical conductor configurations with and without transposition. Calculation of Capacitance for 2 wire and 3 wire systems, effect of ground on Capacitance, Capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems

UNIT –2: Performance of transmission lines: (9)

Classification of Transmission Lines-Short, medium and long line and their models representation -Nominal-T, Nominal-п and A, B, C, D Constants for symmetrical networks, Numerical Problems and solutions for estimating regulation and efficiency of all types of lines. Ferranti effect and Charging Current

UNIT –3: Overhead line insulators: (9)

Types of Insulators, String efficiency and Methods for improvement, – Voltage Distribution, Calculation of String efficiency, Capacitance Grading and Static Shielding., Numerical Problems.

Sag and Tension: Sag and Tension Calculations with equal and unequal heights of towers, Effect of wind and ice on weight of conductor, Stringing chart, Sag template and its applications Numerical Problems.

Corona: Corona- factors affecting corona, critical voltages and Power loss due to Corona. Radio Interference.

UNIT –4: POWER SYSTEM TRANSIENTS (9)

Types of system transients-Travelling or propagation of surges- attenuation, distortion, reflection and refraction coefficients- termination of lines with different types of conditions – open circuited line, short circuited line, T-junction (numerical problems)-Bewley Lattice diagrams (for all cases mentioned with numerical examples).

UNIT –5: VOLTAGE CONTROL AND POWER FACTOR IMPROVEMENT: (9)

Methods of voltage control, shunt and series capacitors / Inductors, tap changing

transformers, synchronous phase modifiers, power factor improvement methods.
Compensation in Power Systems: Concepts of Load compensation Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrical line – Radial line with asynchronous load – Compensation of lines.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Analyse the transmission lines and obtain the transmission line parameters and constants	**PO1, PO2, P03, PO4**
CO2	Analyse transmission line performance	**PO1, PO2, P03, PO4**
CO3	Design transmission lines to meet the day-to-day power requirements.	**PO1, PO2, P03**
CO4	Understand and apply Per Unit System for Fault Calculations	**PO1, PO2, P03, PO4**
CO5	Apply load compensation techniques to control reactive power.	**PO1, PO2, P03,PO4**

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 Mc Graw Hill Pub. Co.,New Delhi, Fourth edition, 2011.
3. B.R.Gupta,―Power System Analysis and Design‖, S.ChandPublishing.1998.

REFERENCE BOOKS:

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

REFERENCE WEBSITE:

1. **https://onlinecourses.nptel.ac.in/noc22_ee17/preview**

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	-	-	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	**-**	-
CO4	3	3	2	3		-	-	-	-	-	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2.6**	**3**	-	-	-	-	-	-	**-**	-

III B. TECH V SEM

23ECE355E	SIGNALS AND SYSTEMS (PROFESSIONAL ELECTIVE I)	L T P C 3 0 0 3

PRE-REQUISITES: Basic Mathematics

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the basic properties of signal & systems and LTI systems.
2. To learn Fourier series representation of periodic signals.
3. To study representation of signals in continuous and discrete time Fourier transform
4. To analyze the sampling theorem and characterize signals & systems in time & frequency domain.
5. To apply Laplace transform and Z transform to study about the stability of systems.

UNIT I - SIGNALS AND SYSTEMS (9)

Continuous and Discrete Time Signals, Elementary Signals-Unit Impulse, Unit Step Functions, Ramp Signal, Rectangular function, Signum Function, Sinc & Sa Function, Exponential and Sinusoidal Signals, Classification of Signals & Systems, Continuous and Discrete Time Systems, Basic System Properties, Linear Time Invariant (LTI) Systems, Discrete-Time LTI Systems, Convolution Sum, Continuous Time LTI Systems, Convolution Integral, Properties of LTI Systems, Causal LTI Systems described by Differential and Difference Equations, Singularity Functions.

UNIT II- FOURIER SERIES REPRESENTATION OF PERIODIC SIGNALS (9)

Fourier Series Representation of Continuous Time Periodic Signals, Trigonometric, Exponential fourier Series & related problems, Convergence of the Fourier Series, Properties of Continuous Time Fourier Series.

UNIT III- THE CONTINUOUS-TIME FOURIER TRANSFORM (9)

Representation of aperiodic Signals, Continuous Time Fourier Transform, Fourier Transform for Periodic Signals, Properties of the Continuous Time Fourier Transform, Systems characterized by Linear constant coefficient differential equations, Discrete Time Fourier Transform - Representation of Aperiodic Signals, Discrete Time Fourier Transform, Frequency Response, Systems Characterized by Linear Constant-Coefficient Difference Equations.

UNIT IV - CHARACTERIZATION OF SIGNALS AND SYSTEMS (9)

Sampling: Representation of a Continuous Time Signal by Its Samples, Sampling Theorem, Reconstruction of a Signal from Its Samples Using Interpolation, Effect of under sampling: Aliasing, Discrete Time Processing of Continuous-Time Signals.

UNIT V LAPLACE AND Z-TRANSFORMS (9)

The Laplace Transform, Region of Convergence for Laplace Transforms, Inverse Laplace Transform, Properties of the Laplace Transform, Some Laplace Transform Pairs, Analysis and Characterization of LTI Systems Using the Laplace Transform, Unilateral Laplace Transform, Z-Transform - Region of Convergence for the z-Transform, Inverse z-Transform, Properties of the z-Transform, Some Common z-Transform Pairs, Analysis and Characterization of LTI Systems Using z-Transforms, Unilateral z-Transforms.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Explain the basic properties of signal & systems and LTI systems.	**PO1, PO2**
CO2	Apply Fourier series to represent periodic signals.	**PO1, PO2, PO3**
CO3	Represent signals in continuous and discrete time Fourier transform.	**PO1, PO2**
CO4	Analyze the sampling theorem and characterize signals & systems in time & frequency domain.	**PO1, PO2, PO3**
CO5	Analyse the stability of systems by applying Laplace transform and Z transform .	**PO1, PO2, PO3**

TEXT BOOKS:

1. Signals and Systems, Alan V. Oppenheim, Alan S. Willsky, & S. Hamid, 2nd Edition, Pearson Higher Education, 1997.
2. Principles of Linear Systems and Signals, B.P. Lathi, 2nd Edition, Oxford University Press, 2011.

REFERENCE BOOKS:

1. Signals & Systems, Simon Haykin and B. Van Veen, 2nd Edition, John Wiley, 2003.
2. Signals and systems, Narayana Iyer and K Satya Prasad, 1st Edition, CENGAGE Learning, 2011.

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.8**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

23EEE353A	ELECTRICAL SAFETY and RISK MANAGEMENT (PROFESSIONAL ELECTIVE-I)	L T P C 3 0 0 3

PRE-REQUISITES:

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the Electrical Safety, Shocks and Their Prevention.
2. To learn Safety During Installation of Plant and Equipment.
3. To study Electrical Safety In Residential, Commercial and Agricultural Installations
4. To analyze Electrical Safety in Hazardous Areas
5. To apply Safety Management of Electrical Systems.

UNIT –1: INTRODUCTION TO ELECTRICAL SAFETY, SHOCKS AND THEIR PREVENTION: (9)

Terms and definitions, objectives of safety and security measures, Hazards associated with electric current and voltage, who is exposed, principles of electrical safety, Approaches to prevent Accidents, scope of subject electrical safety. Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over�si, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shops

UNIT –2: SAFETY DURING INSTALLATION OF PLANT AND EQUIPMENT: (9)

Introduction, preliminary preparations, preconditions for start of installation work, during, risks during installation of electrical plant and equipment, safety aspects during installation, field quality and safety during erection, personal protective equipment for erection personnel, installation of a large oil immersed power transformer, installation of outdoor switchyard equipment, safety during installation of electrical rotating machines, drying out and insulation resistance measurement of rotating machines.

UNIT –3: ELECTRICAL SAFETY IN RESIDENTIAL, COMMERCIAL AND AGRICULTURAL INSTALLATIONS: (9)

Wiring and fitting – Domestic appliances – water tap giving shock – shock from wet wall – fan firing shock – multi-storied building – Temporary installations – Agricultural pump installation –Do‟s and Don‟ts for safety in the use of domestic electrical appliances.

UNIT –4: ELECTRICAL SAFETY IN HAZARDOUS AREAS: (9)

Hazardous zones – class 0,1 and 2 – spark, flashovers and corona discharge and functional requirements – Specifications of electrical plants, equipment's for hazardous locations – Classification of equipment enclosure for various hazardous gases and vapours – classification of equipment/enclosure for hazardous locations. Equipment Earthing and System Neutral Earthing: Introduction, Distinction between system grounding and Equipment Grounding, Equipment Earthing, Functional Requirement of earthing system, description of a earthing system, neutral grounding (System Grounding), Types of Grounding, Methods of Earthing Generators Neutrals.

UNIT –5: SAFETY MANAGEMENT OF ELECTRICAL SYSTEMS: (9)

Principles of Safety Management, Management Safety Policy, Safety organization, safety auditing, Motivation to managers, supervisors, employees. Review of IE Rules and Acts and Their Significance: Objective and scope – ground clearances and section clearances – standards on electrical safety - safe limits of current, voltage –Rules regarding first aid and firefighting facility. The Electricity Act, 2003, (Part1, 2, 3,4 & 5)

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Explain the objectives and precautions of Electrical Safety, effects of Shocks and their Prevention	**PO1, PO2**
CO2	Summarize the Safety aspects during Installation of Plant and Equipment	**PO1, PO2, P03**
CO3	Describe the electrical safety in residential, commercial and agricultural installations	**PO1, PO2, P03**
CO4	Describe the various Electrical Safety in Hazardous Areas, Equipment Earthing and System Neutral Earthing	**PO1, PO2, P03**
CO5	State the electrical systems safety management and IE rules.	**PO1, PO2**

TEXT BOOKS:

1. S. Rao, Prof. H.L. Saluja, —Electrical safety, fire safety Engineering and safety management‖,Khanna Publishers. New Delhi, 1988.(units-I to V).
2. www.apeasternpower.com/downloads/elecact2003.pdf (Part of unit-V)

REFERENCE BOOKS:

1. Pradeep Chaturvedi, "Energy management policy, planning and utilization", Concept Publishing company, New Delhi, 1997.

REFERENCE WEBSITE:

https://onlinecourses.swayam2.ac.in/nou20_cs08/preview

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	-	-	-	-	-	-	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-
CO4	3	3	2	3		-	-	-	-	-	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2.6**	**3**	-	-	-	-	-	-	-	-

III B. TECH V SEM

23EEE353B	DIGITAL CONTROL SYSTEM (PROFESSIONAL ELECTIVE-I)	L T P C
		3 0 0 3

PRE-REQUISITES: A Course on Linear Control system

COURSE EDUCATIONAL OBJECTIVES:

1. Provide the knowledge on sampling and reconstruction.
2. Offer the knowledge on Discrete time control and state space analysis
3. Afford the knowledge on controllability and observability.
4. Offer knowledge on design of state feedback controllers and observers.
5. Provide the knowledge on stability analysis.

UNIT -1: SAMPLING AND RECONSTRUCTION & Z-TRANSFORMS (9)

Introduction - Examples of Data control systems – Digital to Analog conversion and Analog to Digital conversion - sample and hold operations. Linear difference equations - pulse response - Z – transforms - Theorems of Z – Transforms - the inverse Z – transforms - Modified Z- Transforms - Z-Transform method for solving difference equations.

UNIT -2: STATE SPACE ANALYSIS OF DISCRETE TIME CONTROL SYSTEM (9)

Pulse transforms function - block diagram analysis of sampled – data systems - mapping between S-plane and z-plane. State Space Representation of discrete time systems - Pulse Transfer Function Matrix solving discrete time state space equations - State transition matrix and its Properties - Methods for Computation of State Transition Matrix - Discretization of continuous time state space equations.

UNIT -3: CONTROLLABILITY AND OBSERVABILITY (9)

Concepts of Controllability and Observability - Tests for controllability and Observability. Duality between Controllability and Observability - Controllability and Observability conditions for Pulse Transfer function.

UNIT -4: STATE FEEDBACK CONTROLLERS AND OBSERVERS (9)

Design of state feedback controller through pole placement – Necessary and sufficient conditions - Ackerman's formula. State Observers – Full order and Reduced order observers

UNIT -5: STABILITY ANALYSIS (9)

Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci - Constant damping ratio loci - Stability Analysis of closed loop systems in the Z-Plane. Jury and stability test – Stability Analysis by use of the Bilinear Transformation and Routh stability criterion.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be		Pos & PSOs
CO1	Able to analyze sampling and reconstruction	PO1,PO2,PO3
CO2	Able to analyze Discrete time control and state space analysis.	PO1,PO2,PO3
CO3	Able to identify controllability and observability of systems.	PO1,PO2
CO4	Able to design state feedback controllers and observers.	PO1,PO2,PO3,PO4,PO12
CO5	Able to evaluate stability of different systems.	PO1,PO3,PO4

TEXTBOOKS:

1. K. Ogata "Discrete-Time Control systems" - - Pearson Education/PHI - 2nd Edition
2. M.Gopal "Digital Control and State Variable Methods"– TMH

REFERENCE BOOKS:

1. Kuo "Digital Control Systems", Oxford University Press - 2nd Editions - 2003.
2. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems" Prentice Hall, 12th edition, 2010.
3. John J.D., Azzo Constantine, H. and Houpis Sttuart, N Sheldon, "Linear Control System Analysis and Design with MATLAB", CRC Taylor& Francis Reprint 2009.
4. Rames C.Panda and T. Thyagarajan, "An Introduction to Process Modelling Identification and Control of Engineers", Narosa Publishing House, 2017.

REFERENCE WEBSITE:

1. NPTEL Video Lecture Notes on "Control Engineering "by Prof. S. D. Agashe, IIT Bombay.
2. https://nptel.ac.in/courses/108/103/108103008/

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	2		-	-	-	-	-	-	3
CO5	3	-	2	2	-	-	-	-	-	-	-	-
CO*	2.4	**3**	**2**	**2**	-	-	-	-	-	-	-	3

III B. TECH V SEM

23EEE353C	UTILIZATION OF ELECTRICAL ENERGY (PROFESSIONAL ELECTIVE-I)	L T P C 3 0 0 3

PRE-REQUISITES:

COURSE EDUCATIONAL OBJECTIVES:
1. To understand the Type of electric drives.
2. To study Electric Heating & Welding.
3. To study laws of illumination
4. To analyze System of electric traction and track electrification
5. To study Electrolytic Process

UNIT –1: ILLUMINATION: (9)
Introduction - terms used in illumination - laws of illumination - sources of light. Discharge lamps – mercury vapor and sodium vapor lamps–comparison between tungsten filament lamps and fluorescent tubes–compact fluorescent lamp–LED-Basic principles of light control-Types and design of good lighting system and practice - flood lighting.

UNIT –2: ELECTRIC HEATING & WELDING: (9)
Introduction: Advantages and methods of electric heating - resistance heating - induction heating and dielectric heating. Electric welding: Classification- resistance and arc welding - electric welding equipment -comparison between AC and DC Welding.

UNIT –3: ELECTRIC DRIVES: (9)
Type of electric drives – rating and choice of motor - starting and running characteristics – particular applications of electric drives - types of industrial loads - Continuous - intermittent and variable loads.

UNIT –4: ELECTRIC TRACTION: (9)
Traction systems: System of electric traction and track electrification - Review of existing electric traction systems in India - Special features of traction motor - Speed-time curves for different services - methods of electric braking - plugging - rheostatic braking - regenerative braking. Introduction to Magnetic Levitation vehicles.

UNIT –5: ELECTROLYTIC PROCESS: (9)
Introduction - Basic principles - Faradays laws of electrolysis - Energy efficiency – Electro deposition -Factors governing deposition Processes - Deposition of Alloys – Extraction and refining of metals. Fuel Cells.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Apply the appropriate electric drives for various industrial applications.	PO1, PO2, P03,PO4
CO2	Understand the different types of heating and welding techniques.	PO1, PO2

CO3	Design an illumination system for the proper lighting system.	**PO1, PO2, P03**
CO4	Understand the basic principle and different braking techniques of electric traction	**PO1, PO2**
CO5	Understand the basic principle and applications of the electrolytic process.	**PO1, PO2**

TEXT BOOKS:

1. C.L Wadhwa, Generation Distribution and Utilization of Electrical Energy, New age International Publishers,
2. J. B. Gupta, Utilization of Electrical Power and Electric Traction, S. K. Kataria and sons, 2002
3. G. C. Garg (2005), Utilization of Electrical Power & Electric traction, 8th edition, Khanna publishers, New Delhi.
4. N. V. Suryanarayana, Utilization of Electrical Power including Electric drives and Electric traction, New Age International (P) Limited, Publishers, 1996.

REFERENCE BOOKS:

1. Partab (2007), Art & Science of Utilization of electrical Energy, 2nd edition, Dhanpat Rai & Sons, New Delhi.
2. Alan. V. Oppenheim, Ronald. W. Schafer, John R Buck, Discrete Time Signal Processing, PrenticeHall,2ndedition,2006.E.Openshaw T aylor, Utilization of Electric Energy, Orient Longman,1971.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/108105060
2. https://nptel.ac.in/courses/112105221
3. https://vssut.ac.in/lecture_notes/lecture1426861925.pdf
4. https://vpmpee.wordpress.com/uee-3340903/

CO-PO MAPPING:

PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	-	-	-	-	-	-	-	-	-	-
CO.2	3	3	3	-	-	-	-	-	-	-	-	-
CO.3	3	3	3	-	-	-	-	-	-	-	-	-
CO.4	3	3	3	-	-	-	-	-	-	-	-	-
CO.5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**3**	**-**	**-**	-	-	-	-	-	-	-

III B. Tech –V semester

230CE351A	GREEN BUILDINGS (OPEN ELECTIVE -I) (Civil Branch)	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Nil

Course Educational Objectives:

1. To understand the fundamental concepts of green buildings, their necessity, and sustainable features.
2. To analyze green building concepts, rating systems, and their benefits in India.
3. To apply green building design principles, energy efficiency measures, and renewable energy sources.
4. To evaluate air conditioning systems, HVAC designs, and energy modeling for sustainable buildings.
5. To assess material conservation strategies, waste management, and indoor environmentally quality in green buildings.

UNIT–I (9)

Introduction to Green Building– Necessity of Green Buildings, Benefits of Green Buildings, Green Building Materials and Equipment in India, Key Requisites for Constructing a Green Building, Important Sustainable Features for Green Buildings.

UNIT– II (9)

Green Building Concepts and Practices– Indian Green Building Council, Green Building Movement in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities and Benefits: Opportunities of Green Buildings, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy-Saving Approaches in Buildings, LEED India Rating System, and Energy Efficiency.

UNIT–III (9)

Green Building Design– Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximizing System Efficiency, steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

UNIT–IV (9)

Air Conditioning– Introduction, CII Godrej Green Business Centre, Design Philosophy, Design Interventions, Energy Modeling, HVAC System Design, Chiller Selection, Pump Selection, Selection of Cooling towers, Selection of Air Handling Units, Pre-Cooling of Fresh Air, Interior Lighting Systems, Key Features of the Building, Eco-Friendly Captive Power Generation for Factories, Building Requirements.

UNIT–V (9)

Material Conservation– Handling of Non-Process Waste, Waste Reduction During Construction, Materials with Recycled Content, Local Materials, Material Reuse, Certified Wood, Rapidly Renewable Building Materials and Furniture. Indoor Environment Quality and Occupational Health– Air Conditioning, Indoor Air Quality, Sick Building Syndrome, tobacco Smoke.

Total Hours: 45

COURSE OUTCOMES:

on successful completion of the course, students will be able to:		POs
CO1	Understand the importance of green buildings, their necessity, and sustainable features.	**PO1,PO6,PO7**
CO2	Analyze various green building practices, rating systems, and their impact on environmental sustainability.	**PO2,PO5,PO7**
CO3	Apply principles of green building design to enhance energy efficiency and incorporate renewable energy sources.	**PO3,PO5,PO4, PO7**
CO4	Evaluate HVAC systems, energy-efficient air conditioning techniques, and their role in sustainable building design.	**PO3,PO5,PO4, PO7**
CO5	Assess material conservation techniques, waste reduction strategies, and indoor air quality management in green buildings.	**PO6,PO7,PO8, PO9**

TEXT BOOKS:

1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air Conditioning Engineers, 2009.
2. Green Building Hand Book by to Molley and Skimming's, 2009.

REFRENCE BOOKS:

1. Complete Guide to Green Buildings by Trish riley
2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009
3. Energy Conservation Building Code–ECBC-2020, published by BEE

REFRENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/105/102/105102195/

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	2	3	-	-	-	-	-
CO2	-	3	-	-	2	-	3	-	-	-	-	2
CO3	-	-	3	3	3	-	3	-	-	-	-	-
CO4	-	-	3	3	3	-	3	-	-	-	-	-
CO5	-	-	-	-	-	3	3	3	2	-	-	-
CO*	**3**	**3**	**3**	**3**	**2.6**	**2.5**	**3**	**3**	**2**	**-**	**-**	**2**

III B. Tech – V Semester

230CE351B	**CONSTRUCTION TECHNOLOGY AND MANAGEMENT (OPENELECTIVE– I)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE EDUCATIONAL OBJECTIVES

1. To understand project management fundamentals, organizational structures, and leadership principles in construction.
2. To analyze manpower planning, equipment management, and cost estimation in civil engineering projects.
3. To apply planning, scheduling, and project management techniques such as CPM and PERT.
4. To evaluate various contract types, contract formation, and legal aspects in construction management.
5. To assess safety management practices, accident prevention strategies, and quality management systems in construction.

UNIT–I **(9)**

Introduction: Project forms, Management Objectives and Functions; Organizational Chart of a Construction Company; Manager's Duties and Responsibilities; Public Relations; Leadership and Team - Work; Ethics, Morale, Delegation and Accountability.

UNIT–II **(9)**

Man, and Machine: Man-Power Planning, Training, Recruitment, Motivation, Welfare Measures and Safety Laws; Machinery for Civil Engineering., Earth Movers and Hauling Costs, Factors Affecting Purchase, Rent, and Lease of Equipment, and Cost Benefit Estimation.

UNIT–III **(9)**

Planning, Scheduling and Project Management: Planning Stages, Construction Schedules and Project Specification, Monitoring and Evaluation; Bar-Chart, CPM, PERT, Network-formulation and Time Computation.

UNIT–IV **(9)**

Contracts: Types of Contracts, formation of Contract – Contract Conditions – Contract for Labour, Material, Design, and Construction – Drafting of Contract Documents Based On IBRD/ MORTH Standard Bidding Documents – Construction Contracts – Contract Problems – Arbitration and Legal Requirements Computer Applications in Construction Management: Software for Project Planning, Scheduling and Control.

UNIT–V **(9)**

Safety Management – Implementation and Application of QMS in Safety Programs, ISO 9000 Series, Accident Theories, Cost of Accidents, Problem Areas in Construction Safety, Fall Protection, Incentives, Zero Accident Concepts, Planning for Safety, Occupational Health and Ergonomics

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand project management fundamentals, organizational structures, and leadership principles in construction.	**PO1,PO6,PO8, PO9**
CO2	Analyze manpower planning, equipment management, and cost estimation in civil engineering projects.	**PO2,PO5,PO12**
CO3	Apply planning, scheduling, and project management techniques such as CPM and PERT.	**PO3,PO5,PO4, PO10**
CO4	Evaluate various contract types, contract formation, and legal aspects in construction management.	**PO3,PO5,PO4, PO8**
CO5	Assess safety management practices, accident prevention strategies, and quality management systems in construction.	**PO6,PO7,PO8, PO9**

TEXT BOOKS:

1. Construction Project Management, SK. Sears, GA. Sears, RH. Clough, John Wiley and Sons, 6th Edition, 2016.
2. Construction Project Scheduling and Control by Saleh Mubarak, 4th Edition, 2019
3. Pandey, I.M (2021) Financial Management 12th edition. Pearson India Education Services Pvt. Ltd.

REFRENCE BOOKS:

1. Brien, J.O. and Plotnick, F.L., C P Min Construction Management, McGraw Hill, 2010.
2. Punima, B.C., and Khandelwal, K.K., Project Planning and control with PERT and CPM, Laxmi Publications, 2002.
3. Construction Methods and Management: Pearson New International Edition 8th Edition Stephens Nominally.
4. Rhoden, M and Cato B, Construction Management and Organizational Behavior, Wiley- Blackwell, 2016.

REFRENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/105/104/105104161/
2. https://archive.nptel.ac.in/courses/105/103/105103093/

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	2	-	2	2	-	-	-
CO2	-	3	-	-	2	-	-	-	-	-	-	2
CO3	-	-	3	3	3	-	-	-	-	2	-	-
CO4	-	-	3	3	3	-	-	2	-	-	-	-
CO5	-	-	-	-	-	3	3	3	2	-	-	-
CO*	**3**	**3**	**3**	**3**	**3**	**2.7**	**3**	**2.6**	**2**	**2**	**-**	**2**

III B. Tech – V Semester

23OECE351A	ELECTRONIC CIRCUITS	L T P C
		3 0 0 3

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To understand semiconductor diodes, their characteristics and applications.
2. To explore the operation, configurations, and biasing of BJTs.
3. To study the operation, analysis, and coupling techniques of BJT amplifiers.
4. To learn the operation, applications and uses of feedback amplifiers and oscillators.
5. To analyze the characteristics, configurations, and applications of operational amplifiers.

UNIT –1: SEMICONDUCTOR DIODES (9)

Semiconductor Diode and Applications: Introduction, PN junction diode – structure, operation and VI characteristics, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only). Special Diodes: Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator.

UNIT –2: BJT AND ITS BIASING (9)

Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch and Amplifier, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias.

UNIT –3: SINGLE STAGE AMPLIFIER (9)

Single stage amplifiers: Classification of Amplifiers - Distortion in amplifiers, Analysis of CE, CC and CB configurations with simplified hybrid model.

UNIT –4: FEEDBACK AMPLIFIERS AND OSCILLATORS (9)

Feedback amplifiers: Concepts of feedback, Classification of feedback amplifiers, Effect of feedback on amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations (Qualitative treatment only). Oscillators: Classification of oscillators, Condition for oscillations, RC Phase shift Oscillators, Generalized analysis of LC Oscillators-Hartley and Colpitts Oscillators.

UNIT –5: OPAMP AND ITS APPLICATIONS (9)

Op-amp: Classification of IC'S, basic information of Op-amp, ideal and practical Op-amp, 741 opamp and its features, modes of operation-inverting, non-inverting, differential. Applications of op-amp: Summing, scaling and averaging amplifiers, Integrator, Differentiator, phase shift oscillator and comparator.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand semiconductor diodes, their characteristics and applications.	**PO1, PO2**
CO2	Explore the operation, configurations, and biasing of BJTs.	**PO1, PO2**
CO3	Gain knowledge about the operation, analysis, and coupling techniques of BJT amplifiers.	**PO1, PO2**
CO4	Learn the operation, applications and uses of feedback amplifiers and oscillators.	**PO1, PO2**
CO5	Analyze the characteristics, configurations, and applications of operational amplifiers.	**PO1, PO2**

TEXT BOOKS:

1. Electronics Devices and Circuits, J.Millman and Christos. C. Halkias, 3 rd edition, Tata McGraw Hill, 2006.
2. Electronics Devices and Circuits Theory, David A. Bell, 5 th Edition, Oxford University press. 2008

REFERENCE BOOKS:

1. Electronics Devices and Circuits Theory, R.L.Boylestad, Lousis Nashelsky and K.Lal Kishore, 12th edition, 2006, Pearson, 2006.
2. Electronic Devices and Circuits, N.Salivahanan, and N.Suresh Kumar, 3 rd Edition, TMH, 2012
3. Microelectronic Circuits, S.Sedra and K.C.Smith, 5 th Edition, Oxford University Press.

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

III B.Tech. - V Semester

230CS351A	JAVA PROGRAMMING	L T P C
		3 0 0 3

PRE-REQUISITES: A course on Introduction to Programming

COURSE EDUCATIONAL OBJECTIVES:

1. Identify Java language components and how they work together in applications
2. Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
3. learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
4. understand how to design applications with threads in Java
5. understand how to use Java APis for program development

UNIT 1: Object Oriented Programming: Basic concepts, Principles (9)

Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style.

Data Types, Variables, and Operators: Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final,

Introduction to Operators, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if-else Expressions, Ternary Operator(?:), Switch Statement, Iteration Statements, while Expression, do-while Loop, for Loop, Nested for Loop, For-Each for Loop, Break Statement, Continue Statement.

UNIT 2: (9)

Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

UNIT 3: (9)

Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class- Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

UNIT 4: (9)

Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto- unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

Java I/O and File: Java I/0 API, standard I/0 streams, types, Byte streams, Character streams, Scanner class, Files in Java (Text Book 2)

UNIT 5: (9)

String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

Multithreaded Programming: Introduction, need for Multiple Threads Multithreaded Programming for Multi-Core Processor, Thread Class, Main Thread-Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter-thread Communication - Suspending, Resuming, and Stopping of Threads.

Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL connector/J, JDBC Environment Setup, Establishing JDBC Database connections, Result Set Interface

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course the student will be		POs
CO1	Analyze problems, design solutions using ODP principles, and implement them efficiently in Java.	**PO1,PO2,PO5**
CO2	Analyze with a focus on attributes, behaviors, and relationships between objects.	**PO1, P04,P05**
C03	Demonstrate an understanding *of* inheritance hierarchies and polymorphic behavior, including method overriding and dynamic method dispatch.	**P01,P03,P04, POS**
C04	Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.	**P01,P04, P05**
C05	Perform file input/output operations, including reading from and writing to files using Java 1/0 classes, graphical user interface (GUI) programming using JavaFX.	**PO1,PO2,PO4, PO5**

TEXT BOOKS:

I. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023,
3. JAVA for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson

REFERENCES:

1. The complete Reference Java, 11thedition, Herbert Schildt, TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

REFERENCE WEBSITE:

1. https·//nptc1 ac in /courses/106 /1OS/106105191 /
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lexauthO12 880464547618816347shared /overview

CO-PO MAPPING:

CO\ PO	P01	P02	P03	P04	PO5	P06	P07	P08	P09	P010	P011	P0 12
CO1	3	-	-	-	2	-	-	-	-	-	-	-
CO2	2	–	–	3	3	–	–	–	–	–	–	–
CO3	3	–	3	3	3	–	–	–	–	–	–	–
CO4	3	–	–	3	3	–	–	–	–	–	–	–
CO5	2	3	-	3	3	-	-	-	-	-	-	-
COs	**2.6**	**3**	**3**	**3**	**2.8**	-	-	-	-	-	-	-

III B.Tech - V Semester

230AI351A	**FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE EDUCATIONAL OBJECTIVES:

1. To learn the distinction Between optimal reasoning Vs. human like reasoning.
2. To understand the concepts of state space representation, exhaustive search, heuristic
3. Search together with the time and space complexities.
4. To learn different knowledge representation techniques.
5. To understand the applications of AI, namely game playing, theorem proving, and machine learning.

UNIT-1: Introduction to AI Searching for Solutions (9)

Intelligent Agents, Problem-Solving Agents, searching for Solutions-Breadth-first search, Depth- first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.

UNIT-2: Games & Logic (9)

Games - Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, Logic- Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

UNIT-3: First-Order Logic & Knowledge Representation (9)

First-Order Logic **-**Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First- Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution. Knowledge Representation**:** Onto logical Engineering, Categories and Objects, Events.

UNIT-4: Planning (9)

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

UNIT-5: Probabilistic Reasoning (9)

Probabilistic Reasoning**:** Acting under Uncertainty, Basic Probability Notation Bayes‵ Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.

TOTAL HOURS:45

COURSE OUTCOMES:

On successful completion of the course the student will be		POs
CO1	Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.	**PO1,PO2**
CO2	Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.	**PO1,PO3**
CO3	Learn different knowledge representation techniques.	**PO1,PO2,PO4**
CO4	Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities	**PO1,PO2,PO3, PO4**
CO5	Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.	**PO1,PO2,PO4, PO5**
CO6	Analyze Supervised Learning Vs. Learning Decision Tree	**PO1,PO2**

TEXTBOOK:

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

REFERENCEBOOKS:

1. Artificial Intelligence, 3rdEdn., E. Richand K. Knight(TMH)
2. Artificial Intelligence, 3rdEdn. ,Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems–Patterson, Pearson Education.

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	-	3	-	-	-	-	-	-	-	-	-
CO3	3	2	-	2	-	-	-	-	-	-	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-
CO5	3	3	-	3	2	-	-	-	-	-	-	-
CO*	**3**	**2.8**	**1.2**	**1.4**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

III B.Tech. - V Semester

23OMEC351A	SUSTAINBLE ENERGY TECHNOLOGIES	L T P C
		3 0 0 3

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To demonstrate the importance, the impact of solar radiation, solar PV modules
2. To understand the principles of storage in PV systems
3. To discuss solar energy storage systems and their applications.
4. To get knowledge in wind energy and bio-mass
5. To gain insights in geothermal energy, ocean energy and fuel cells.

UNIT –1: SOLAR RADIATION: (9)

Roles and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems.

SOLAR PV MODULES AND PV SYSTEMS: PV Module Circuit Design, Module Structure, Packing Density, Interconnections, Mismatch and Temperature Effects, Electrical and Mechanical Insulation, Lifetime of PV Modules, Degradation and Failure, PV Module Parameters, Efficiency of PV Module, Solar PV Systems-Design of Off Grid Solar Power Plant. Installation and Maintenance

UNIT –2: STORAGE IN PV SYSTEMS: (9)

Battery Operation, Types of Batteries, Battery Parameters, Application and Selection of Batteries for Solar PV System, Battery Maintenance and Measurements, Battery Installation for PV System.

UNIT –3: SOLAR ENERGY COLLECTION: (9)

Flat plate and concentrating collectors, classification of concentrating collectors, orientation.

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

UNIT –4: WIND ENERGY: (9)

Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

UNIT–5: GEOTHERMAL ENERGY: (9)

Origin, Applications, Types of Geothermal Resources, Relative Merits. OCEAN ENERGY: Ocean Thermal Energy; Open Cycle & Closed Cycle OTEC Plants, Environmental Impacts, Challenges.

FUEL CELLS: Introduction, Applications, Classification, Different Types of Fuel Cells Such as Phosphoric Acid Fuel Cell, Alkaline Fuel Cell, PEM Fuel Cell, MC Fuel Cell.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Define and explain the evolution and need for rapid prototyping in modern product development.	**PO1,PO2,PO3, PO4**
CO2	Compare and contrast various 3D printing technologies based on working principles, materials, and limitations.	**PO1,PO2,PO3, PO4**
CO3	Apply knowledge of rapid tooling and reverse engineering techniques for industrial and design applications.	**PO1,PO2,PO3, PO4**
CO4	Diagnose and interpret different types of errors encountered in 3D printing processes and recommend solutions.	**PO1,PO2,PO3, PO4**
CO5	Use RP-specific software tools to manipulate STL files and prepare models for printing in real-world scenarios.	**PO1,PO2,PO3, PO4**

TEXT BOOKS:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH
2. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006

REFERENCE BOOKS:

1. Frank W.Liou, ―Rapid Prototyping & Engineering Applications‖, CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani, ―Rapid Prototyping: Principles and Applications in Manufacturing‖,John Wiley&Sons, 2006.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112106318
2. https://youtube.com/playlist?list=PLyqSpQzTE6M-ZgdjYukayF6QevPv7WE-r&si=-mwIa2X-SuSiNy13

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	2	2	-	-	-	-	-	-	-	-
CO.2	3	2	2	2	-	-	-	-	-	-	-	-
CO.3	3	2	2	2	-	-	-	-	-	-	-	-
CO.4	3	2	2	2	-	-	-	-	-	-	-	-
CO.5	3	2	2	2	-	-	-	-	-	-	-	-

III B Tech- V Semester

		L	T	P	C
23OSH351A	**MATHEMATICS FOR MACHINE LEARNING AND AI**				
	OPEN ELECTIVE-I (COMMON TO ALL)	3	-	-	3

COURSE EDUCATIONAL OBJECTIVES:

1. To provide a strong mathematical foundation for understanding and developing AI/ML algorithms.
2. To enhance the ability to apply linear algebra, probability, and calculus in AI/ML models.
3. To equip students with optimization techniques and graph-based methods used in AI applications.
4. To develop critical problem-solving skills for analyzing mathematical formulations in AI/ML.

UNIT 1: LINEAR ALGEBRA FOR MACHINE LEARNING (9)

Review of Vector spaces, basis, linear independence, Vector and matrix norms, Matrix factorization techniques, Eigen values, eigen vectors, diagonalization, Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).

UNIT 2 PROBABILITY AND STATISTICS FOR AI (9)

Probability distributions: Gaussian, Binomial, Poisson. Bayes'Theorem, Maximum Likelihood Estimation (MLE), and Maximum a Posteriori (MAP).Entropy and Kullback - Leibler (KL) Divergence in AI, Cross entropy loss, Markov chains.

UNIT 3: OPTIMIZATION TECHNIQUES FOR ML (9)

Multivariable calculus: Gradients, Hessians, Jacobians. Constrained optimization: Lagrange multipliers and KKT conditions. Gradient Descent and its variants (Momentum, Adam) Newton's method, BFGS method.

UNIT 4: VECTOR CALCULUS & TRANSFORMATIONS (9)

Vector calculus: Gradient, divergence, curl. Fourier Transform & Laplace Transform in ML applications.

UNIT 5: GRAPH THEORY FOR AI (9)

Graph representations: Adjacency matrices, Laplacian matrices. Bayesian Networks & Probabilistic Graphical Models. Introduction to Graph Neural Networks (GNNs).

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Apply linear algebra concepts to ML techniques like PCA and regression.	**PO1,PO2,PO3,PO4, PO5,PO12**
CO2	Analyze probabilistic models and statistical methods for AI applications.	**PO1,PO2,PO3,PO4, PO5,PO12**
CO3	Implement optimization techniques for machine learning algorithms.	**PO1,PO2,PO3,PO4, PO5,PO6,PO12**
CO4	Utilize vector calculus and transformations in AI-based models.	**PO1,PO2,PO3,PO4, PO5,PO12**
CO5	Develop graph-based AI models using mathematical representations.	**PO1,PO2,PO3,PO4, PO5,PO12**

TEXT BOOKS:

1. Mathematics for Machine Learning by Marc Peter Deisenroth, A.Aldo Faisal, Cheng Soon Ong, Cambridge University Press, 2020.
2. Pattern Recognition and Machine Learning by Christop her Bishop, Springer.

REFERENCE BOOKS:

1. Gilbert Strang, Linear Algebra and Its Applications, Cengage Learning, 2016.
2. Jonathan Gross, Jay Yellen, Graph Theory and Its Applications, CRC Press, 2018.

REFERENCE WEBSITE:

1. MIT–Mathematics for Machine Learning https://ocw.mit.edu
2. Stanford CS229–Machine Learning Course https://cs229.stanford.edu/
3. Deep AI–Mathematical Foundations for AI https://deepai.org

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	1
CO2	3	3	2	3	2	-	-	-	-	-	-	2
CO3	3	3	3	3	2	1	-	-	-	-	-	2
CO4	3	3	2	2	1	-	-	-	-	-	-	1
CO5	3	3	3	3	2	-	-	-	-	-	-	2
CO*	**3**	**3**	**2.4**	**2.6**	**1.6**	**1**						**1.6**

23OSH351B	MATERIALS CHARACTERIZATION TECHNIQUES (OPEN ELECTIVE-I) (Common to all branches)	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To provide exposure to various characterization techniques.
2. To explain the fundamental principles and analytical methods of different spectroscopic techniques.
3. To describe the working principle, limitations, and applications of the Scanning Electron Microscope (SEM).
4. To illustrate the operation of the Transmission Electron Microscope (TEM), including Selected Area Electron Diffraction (SAED)patterns and its applications.
5. To educate on the use of advanced electrical and magnetic instruments in material characterization.

UNIT-1: STRUCTURE ANALYSIS BY POWDER X-RAY DIFFRACTION (9)

Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

UNIT-2: MICROSCOPY TECHNIQUE -1- SCANNING ELECTRON MICROSC OPY (SEM) (9)

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

UNIT-3: MICROSCOPY TECHNIQUE -2 - TRANSMISSION ELECTRON MICROSCOPY (TEM) (9)

Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy

UNIT-4: SPECTROSCOPY TECHNIQUES (9)

Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

UNIT- 5 : ELECTRICAL & MAGNETIC CHARACTERIZATION TECHNIQUES (9)

Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Employ different analytical methods to analyze the crystal structure and crystallite sizes	**PO1, PO2,PO3,PO4,PO5**
CO2	Investigate the morphology of the sample by using a Scanning Electron Microscope	**PO1, PO2,PO3,PO4,PO5**
CO3	Analyze the morphology and crystal structure of the sample by using Transmission Electron Microscope	**PO1, PO2,PO3,PO4,PO5**
CO4	Describe the principle and experimental arrangement of various spectroscopic techniques	**PO1, PO2,PO3,PO4**
CO5	Understand the construction and working principle of various Electrical & Magnetic Characterization technique	**PO1, PO2,PO3,PO4**

TEXTBOOKS:

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods – Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2013.
2. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan, John Wiley & Sons Ltd., 2008

REFERENCE BOOKS:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville Banwell and Elaine M. Mc Cash, Tata McGraw-Hill, 2008.
2. Elements of X-ray diffraction – Bernard Dennis Cullity & Stuart R Stocks, Prentice Hall , 2001 – Science.
3. Practical Guide to Materials Characterization: Techniques and Applications - Khalid Sultan – Wiley – 2021.
4. Materials Characterization Techniques -Sam Zhang, Lin Li, Ashok Kumar -CRC Press - 2008

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/115/103/115103030/
2. https://nptel.ac.in/content/syllabus_pdf/113106034.pdf
3. https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm08/

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-		-		-		-
CO2	3	3	2	1	1	-		-		-		-
CO3	3	3	2	1	1	-		-		-		-
CO4	3	2	1	1	-	-		-		-		-
CO5	3	3	1	1	-	-		-		-		-
CO*	**3**	**3**	**1.6**	**1.2**	**1**	**-**						**-**

III B Tech. V Semester

23OSH351C	CHEMISTRY OF ENERGY SYSTEMS	L	T	P	C
	OPEN ELECTIVE-I	3	-	-	3

COURSE EDUCATIONAL OBJECTIVES:

1. To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
2. To understand the basic concepts of processing and limitations of Fuel cells & their applications.
3. To impart knowledge to the students about fundamental concepts of photo chemical cells, reactions and applications.
4. Necessarily of harnessing alternate energy resources such as solar energy and its basic concepts.
5. To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method.

UNIT-1: ELECTROCHEMICAL SYSTEMS: (9)

Galvanic cell, Nernst equation, standard electrode potential, application of EMF, electrical double layer, polarization, Batteries- Introduction, Lead-acid, Nickel-cadmium, Lithium-ion batteries and their applications.

UNIT-2: FUEL CELLS (9)

Fuel cell- Introduction, Basic design of fuel cell, working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency and applications.

UNIT-3: PHOTO AND PHOTO ELECTROCHEMICAL CONVERSIONS: (9)

Photochemical cells Introduction and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions and their applications.

UNIT-4: SOLAR ENERGY: (9)

Introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar cells and applications.

UNIT-5: HYDROGEN STORAGE: (9)

Hydrogen storage and delivery: State-of-the art, Established technologies, Chemical and Physical methods of hydrogen storage, Compressed gas storage, Liquid hydrogen storage, other storage methods, Hydrogen storage in metal hydrides, metal organic frameworks (MOF), Metal oxide porous structures, hydrogel, and Organic hydrogen carriers.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Solve the problems based on electrode potential, Describe the Galvanic Cell Differentiate between Lead acid and Lithium-ion batteries, Illustrate the electrical double layer	**PO1, PO2, PO2, PO4, PO5**
CO2	Describe the working Principle of Fuel cell, Explain the efficiency of the fuel cell. Discuss about the Basic design of fuel cells, Classify the fuel cell	**PO1, PO2, PO2, PO4, PO6**
CO3	Differentiate between Photo and Photo electrochemical Conversions, Illustrate the photochemical cells, Identify the applications of photochemical reactions, Interpret advantages of photoelectron catalytic conversion.	**PO1, PO2, PO2, PO4, PO5**
CO4	Apply the photo voltaic technology, Demonstrate about solar energy and prospects. Illustrate the Solar cells, discuss about concentrated solar power	**PO1, PO2, PO2, PO4, PO5**
CO5	Differentiate Chemical and Physical methods of hydrogen storage, Discuss the metal organic frame work, Illustrate the carbon and metal oxide porous structures. Describe the liquification methods.	**PO1, PO2, PO2, PO4, PO5**

TEXT BOOKS:

1. Physical chemistry by Ira N. Levine
2. Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3. Inorganic Chemistry, Silver and Atkins

REFERENCE BOOKS:

1. Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG&G technical services And corporation)
2. Hand book of solar energy and applications by Arvind Tiwari and Shyam.
3. Solar energy fundamental, technology and systems by Klaus Jagar et.al.
4. Hydrogen storage by Levine Klebonoff

CO PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	1	2	-	-	-	-	-	-	-
CO2	3	3	2	2	-	2	-	-	-	-	-	-
CO3	2	2	3	2	1	-	-	-	-	-	-	-
CO4	2	3	2	2	3	-	-	-	-	-	-	-
CO5	2	3	2	2	3	-	-	-	-	-	-	-
CO*	**5**	**2.8**	**1.6**	**2.4**	**1.6**	**2**						**-**

III B Tech. - V Semester

		L	T	P	C
23OSH351D	**ENGLISH FOR COMPETITIVE EXAMINATIONS (Open Elective-I)**	**3**	**0**	**0**	**3**

COURSE EDUCATIONAL OBJECTIVES:

1. To enable the students to learn about the structure of competitive English
2. To understand the grammatical aspects and identify the errors
3. To enhance verbal ability and identify the errors
4. To improve word power to answer competitive challenges
5. To make the ready to crack competitive exams

UNIT-1 GRAMMAR-1 (9)

Nouns-classification-errors-Pronouns-types-errors-Adjectives-types-errors-Articles-definite-indefinite- Degrees of Comparison-Adverbs-types- errors-Conjunctions-usage-repositions-usage- Tag Questions, types-identifying errors-Practice

UNIT-2 GRAMMAR-2 (9)

Verbs-tenses-structure-usages-negatives-positives-time adverbs-Sequence of tenses-If Clause-Voice- active voice and passive voice- reported Speech - Agreement-subject and verb - Modals-Spotting Errors- Practices

UNIT-3 VERBALABILITY (9)

Sentence completion-Verbal analogies-Word Groups-Instructions-Critical reasoning-Verbal Deduction-Select appropriate pair - Reading Comprehension - Paragraph - Jumbles - Selecting the proper statement by reading a given paragraph.

UNIT-4 READING COMPREHENSION AND VOCUBULARY (9)

Competitive Vocabulary – Word building – Memory Techniques – Synonyms, Antonyms, Affixes – Prefixes & suffix–One Word Substitutes–Compound words–Phrasal Verbs – Idioms and phrases-

Homophones – Linking words – Modifiers – Intensifiers – Mastering Competitive Vocabulary – Cracking the unknowing passage –Speed Read info Techniques–Skimming and Scanning- Types of answering – Elimination methods.

UNIT-5 WRITING FOR COMPETITIVE EXAMINATIONS (9)

Punctuations and Spelling rules –Word order–Sub skills of Writing –paragraph meaning – Salient features – types – Note making – Note taking- Summarizing - precise writing - Expansion of proverbs – Essay Writing – types.

Total Hours: 45

COURSE OUTCOMES

On successful completion of the course, students will be able to		POs
CO1	Identify the basics of English grammar and its importance	**PO1,PO2,PO3,PO4, PO5,PO12**
CO2	Explain the use of grammatical structures in sentences	**PO1,PO2,PO3,PO4, PO5,PO12**
CO3	Demonstrate the ability to use various concepts in grammar and vocabulary and the applications in everyday use and in competitive exams	**PO1,PO2,PO3,PO4, PO5,PO6,PO12**
CO4	Analyze an unknown passage and reach conclusions about it.	**PO1,PO2,PO3,PO4, PO5,PO12**
CO5	Develop speed reading and comprehending ability thereby perform better in competitive exams	**PO1,PO2,PO3,PO4, PO5,PO12**

TEXT BOOKS:

1. Wren Martin, English for competitive examinations, S.hand &Co,2021.
2. Objective English for competitive examinations, Tata McGraw Hill, NewDelhi,2014.

REFERENCE BOOKS:

1. Hari Mohan Prasad objective English for competitive examination Tata McGraw Hill, New Delhi,2014.
2. Philip Sunil Solomon English for Success in competitive exams, Oxford 2016.
3. Shalini Verma, Word power made Handy S.Chand Publications.
4. Neira Anjanna Dev & Co, Creative Writing: A Beginner's Manual Pearson Education India, 2008.
5. Abhishek Jain, Vocabulary learning Techniques VolI & IIRR Global Publishers 2013.
6. Michael Swan, Practical English Usage, Oxford,2006.

REFERENCE WEBSITE:

1. https://www.grammar.cl/English/partsofspeech.htm
2. https://academicguides.waldenu.edu/writingcenter/grammar/PartsofSpeech
3. https://learnEnglish.britishcouncil.org/grammar/enlgish-grammar—reference/actve–passive-voice.
4. https://www.languagetool.org/Insights/post/verb/tenses/
5. https://www.britishcouncil.in/blog/best/freeEnglish-learningresources-Britishcouncil
6. https://www.careerride.com/post/social-essays-for–competitive-exams-586.aspx

CO PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	1
CO2	3	3	2	3	2	-	-	-	-	-	-	2
CO3	3	3	3	3	2	1	-	-	-	-	-	2
CO4	3	3	2	2	1	-	-	-	-	-	-	1
CO5	3	3	3	3	2	-	-	-	-	-	-	2
CO*	3	3	2.4	2.4	1.6	1						1.6

III B Tech. V Semester

		L	T	P	C
23OSH351E	**ENTREPRENEURSHIP AND NEW VENTURE CREATION (OPEN ELECTIVE-I)**	**2**	**1**	**-**	**3**

COURSE EDUCATIONAL OBJECTIVES:

1. To foster an entrepreneurial mind-set for venture creation and intrapreneurial leadership.
2. To encourage creativity and innovation and also validating customer personas.
3. To enable the students about understand MVP development and validation techniques to determine product-market fit and initiate solution design, prototype for proof of concept.
4. To make the students to create a business plan, financial planning and feasibility analysis to assess the financial viability of a venture.
5. To enable the students to identify potential and aspiration for scale vis-à-vis your venture idea.

UNIT-1: ENTREPRENEURSHIP FUNDAMENTALS AND CONTEXT: (9)

Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models and their role in economic development, an understanding of how to build an entrepreneurial mindset, skill sets, attributes, and networks while on campus.

Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16industries to choose from), Venture Activity.

UNIT-2: PROBLEM & CUSTOMER IDENTIFICATION: (9)

Understanding and analyzing the macro problem and industry perspective – technological, socioeconomic, and urbanization trends and their implications on new opportunities, identifying passion, identifying and defining the problem using design thinking principles, analyzing the problem and validating with the potential customer, understanding customer segmentation, creating and validating customer personas.

Core Teaching Tool: Several types of activities including Class, game, Gen AI, Get out of the Building and Venture Activity.

UNIT-3: SOLUTION DESIGN, PROTOTYPING & OPPORTUNITY ASSESSMENT AND SIZING: (9)

Understanding customer jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition, understanding prototyping and Minimum Viable Product (MVP), developing a feasibility prototype with differentiating value, features, and benefits, assessing relative market position via competition analysis, sizing the market and assessing the scope and potential scale of the opportunity.

Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity.

UNIT-4: BUSINESS & FINANCIAL MODEL, GO-TO-MARKET PLAN: (9)

Introduction to business model and types, lean approach, 9-block canvas model, riskiest assumptions to business models, importance of Build-Measure-Learn approach. Business

Planning: components of business plan – sales plan, people plan, and financial plan. Financial **planning:** types of cost, preparing a financial plan for profitability using a financial template, understanding basics of unit economics, and analyzing financial performance. Introduction to marketing and sales, selecting the right channel, creating digital presence, building customer acquisition strategy. Choosing a form of business organization specific to your venture, identifying sources of funds – debt and equity, mapping the start-up life cycle to funding options.

Core Teaching Tool: Founder Case Studies –Samaand Securely Share; Class activity and discussions; Venture Activities.

UNIT-5: SCALE OUTLOOK AND VENTURE PITCH READINESS: (9)

Understand and identify potential and aspiration for scale vis-à-vis your venture idea. Persuasive storytelling and its key components. Build an investor-ready pitch deck.

Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Develop an entrepreneurial mindset and appreciate the concept of entrepreneurship	PO9, PO12
CO2	Comprehend the process of problem-opportunity identification through design thinking, identify market potential and customers while developing a compelling value proposition solution	PO2, PO4, PO5, PO9, PO11, PO12
CO3	Build a prototype for proof of concept and validate the MVP of their practice venture idea	PO3, PO4,PO5,PO6, PO9, PO11, PO12
CO4	Analyze and refine business models to ensure sustainability and profitability of a venture	PO7, PO9,PO10, PO11, PO12
CO5	Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders	PO9, PO11, PO12

TEXT BOOKS:

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha. Entrepreneurship, McGraw Hill, 11th Edition (2020).
2. Ries, E. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses. Crown Business (2011).
3. Osterwalder, A., & Pigneur, Y. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons (2010).

REFERENCE BOOKS:

1. Simon Sinek. Start with Why. Penguin Books Limited (2011).
2. Brown, Tim. Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation. Harper Business (2019).
3. Namita Thapar. The Dolphin and the Shark: Stories on Entrepreneurship. Penguin Books

CO PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	2	-	-	3
CO2	-	3	-	3	2	-	-	-	3	-	2	3
CO3	-	-	3	2	3	2	-	-	3	-	2	3
CO4	-	-	-	-	-	-	2	-	3	3	2	3
CO5	-	-	-	-	-	-	-	-	3	-	2	3
CO*	-	3	3	2.5	2.5	2	2	-	2.8	3	2	3

23ESC351T	INTRODUCTION TO QUANTUM TECHNOLOGY AND APPLICATIONS	L T P C 3 0 0 3

COURSE OBJECTIVES:

1. Introduce fundamental quantum concepts like superposition and entanglement.
2. Understand theoretical structure of qubits and quantum information.
3. Explore conceptual challenges in building quantum computers.
4. Explain principles of quantum communication and computing.
5. Examine real-world applications and the future of quantum technologies.

UNIT 1: INTRODUCTION TO QUANTUM THEORY AND TECHNOLOGIES (9)

The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India‛s Quantum Mission, EU, USA, China

UNIT 2: THEORETICAL STRUCTURE OF QUANTUM INFORMATION SYSTEMS (9)

What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non- engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract,The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role

UNIT 3: BUILDING A QUANTUM COMPUTER – THEORETICAL CHALLENGES AND REQUIREMENTS (9)

What is required to build a quantum computer (conceptual overview)?,Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers:

Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison),Super conducting circuits, Trapped ions, Photonics, Vision vs reality: what‛s working and what remains elusive, The role of quantum software in managing theoretical complexities

UNIT 4: QUANTUM COMMUNICATION AND COMPUTING – THEORETICAL PERSPECTIVE (9)

Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD), Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once), Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real-World Importance and Future Potential

UNIT 5: APPLICATIONS, USE CASES, AND THE QUANTUM FUTURE (9)

Real-world application domains: Healthcare (drug discovery), Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization, Emerging careers in quantum: roles, skillsets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race

COURSE OUTCOMES:

COs	On successful completion of the course, students will be able to	POS
CO1	Explain core quantum principles in a non-mathematical manner.	**PO1, PO2**
CO2	Compare classical and quantum information systems.	**PO1, PO2, PO3**
CO3	Identify theoretical issues in building quantum computers.	**PO1, PO2**
CO4	Discuss quantum communication and computing concepts	**PO1, PO2, PO3**
CO5	Recognize applications, industry trends, and career paths in quantum technology.	**PO1, PO2, PO3**

TEXTBOOKS:

1. Michael A. Nielsen, Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
3. Chris Bernhardt, *Quantum Computing for Everyone*, MIT Press, 2019.

REFERENCE BOOKS:

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.
4. **Alastair I.M. Rae**, Quantum Physics: A Beginner's Guide, Oneworld Publications, Revised Edition, 2005.
5. **Eleanor G. Rieffel, Wolfgang H. Polak**, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
6. **Leonard Susskind, Art Friedman**, Quantum Mechanics: The Theoretical Minimum, Basic Books, 2014.
7. **Bruce Rosenblum, Fred Kuttner**, Quantum Enigma: Physics Encounters Consciousness, Oxford University Press, 2nd Edition, 2011.

8. **GiulianoBenenti, GiulioCasati, GiulianoStrini**, Principles of Quantum Computation and Information, Volume I: Basic Concepts, World Scientific Publishing, 2004.
9. **K.B. Whaley et al.**, Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document, Quantum Flagship, European Commission, 2020.
10. **Department of Science & Technology (DST), Government of India**, National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers, MeitY/DST Publications, 2020 onward.

REFERENCE WEBSITE:

1. IBM Quantum Experience and Qiskit Tutorials
2. Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley
3. edX – The Quantum Internet and Quantum Computers
4. YouTube – Quantum Computing for the Determined by Michael Nielsen
5. Qiskit Textbook – IBM Quantum

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.8**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

III B.TECH V SEM

23ECE357L **ANALOG AND DIGITAL CIRCUITS LAB**

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

1. To study the characteristics and applications of semiconductor diodes and transistors.
2. To design and analyze rectifiers, amplifiers, and oscillator circuits.
3. To implement basic Op-Amp applications. and implement combinational and sequential logic circuits.
4. To utilize universal gates for logic circuit realization and clock generation.
5. To design and implement essential digital components like adders, multiplexers, flip-flops, encoders, and decoders.

ANALOG CIRCUITS
List of Experiments: (Any 06 Experiments are to be conducted)

1. CB Characteristics
2. CE Characteristics
3. CE Amplifier
4. CC Amplifier
5. Clippers
6. Clampers
7. Hartley & Colpitt's Oscillators.
8. RC Phase shift oscillator
9. Astable multivibrator
10. Monostable multivibrator
11. A to D Convertor
12. D to A Convertor
13. Op-Amp Applications-Adder, subtractor, comparator

DIGITAL CIRCUITS
List of Experiments: (Any 6 Experiments are to be conducted)

1. Realization of Boolean Expressions using Gates
2. Design and realization of logic gates using universal gates
3. Generation of clock using NAND / NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization of a 4 – bit Gray to Binary and Binary to Gray Converter
6. Design and realization of 8x1 MUX using 2x1 MUX
7. Design and realization of 4 bit comparator
8. Design and realization of Flip-Flops.
9. Design and realization of Encoders
10. Design and realization of Decoders
11. Design and realization of Comparator.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand and apply the fundamentals of analog circuits such as amplifiers, oscillators, multivibrators, and op-amp-based circuits.	**PO1**
CO2	Analyze the performance of analog and digital circuits, including waveform characteristics, stability, and truth table verification.	**PO2**
CO3	Design and implement analog circuits and digital circuits to meet specified requirements.	**P03**
CO4	Investigate circuit responses, validate through experiments, troubleshoot errors, and verify designs against theoretical expectations.	**PO4**
CO5	Follow ethical principles in designing, simulating and implementing various circuits.	**PO8**
CO6	Do experiments effectively as an individual and as a member in a group.	**PO9**
CO7	Communicate verbally and in written form, the understandings about the experiments.	**PO10**
CO8	Continue updating their skill related to semiconductors implementation for various application during their life time	**PO12**

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-
CO.2	-	3	-	-	-	-	-	-	-	-	-
CO.3	-	-	3	-	-	-	-	-	-	-	-
CO.4	-	-	-	3	-	-	-	-	-	-	-
CO.5	-	-	-	-	-	-	3	-	-	-	-
CO.6	-	-	-	-	-	-	-	3	-	-	-
CO.7	-	-	-	-	-	-	-	-	3	-	-
CO.8	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

III B.TECH V SEM

23EEE354L	POWER ELECTRONICS LAB (Professional Core)	L	T	P	C
		-	-	3	1.5

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. This course is intended to acquire practical knowledge about the operation of various power converters.
2. To understand the basics of triggering circuits required for various power converters.

CHOOSE ANY TEN FROM THE FOLLOWING LIST:

1. Study of Characteristics of SCR, MOSFET & IGBT.
2. Gate firing circuits for SCR‵s: (a) R triggering (b) R-C triggering.
3. Single Phase AC Voltage Controller with R and RL Loads.
4. Single Phase fully controlled bridge converter with R and RL loads Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E).
5. DC Jones chopper with R and RL Loads.
6. Single Phase Parallel inverter with R and RL loads.
7. Single Phase Cycloconverter with R and RL loads.
8. Single Phase Half controlled converter with R and RL load.
9. Single Phase Fully controlled converter with R and RL load.
10. Three Phase half-controlled bridge converter with R, RL-load.
11. Three Phase fully controlled bridge converter with R, RL-load.
12. Single Phase series inverter with R and RL loads.
13. Single Phase Bridge converter with R and RL loads.
14. Single Phase dual converter with RL loads.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Analyze the Characteristics of Power Semiconductor Devices (SCR, MOSFET, IGBT) and their Role in Power Converters.	PO1
CO2	Design and Implement Gate Firing Circuits for SCR-based Power Converters.	PO2

CO3	Evaluate the Performance of Single-phase and Three-phase Power Converters with R and RL Loads. L5	**PO3**
CO4	Apply Different Commutation Techniques to Analyze Inverter for Efficient Power Control. L3	**PO4**
CO5	Apply Different Commutation Techniques to Analyze Chopper Circuits for Efficient Power Control. L3	**PO5**
CO6	Follow the ethical principles in while doing the exercises	**PO8**
CO7	Do the exercises effectively as an individual and as a team member in a group	**PO9**
CO8	Communicate verbally among team members and in written form, the understanding about the trade exercises.	**PO10**
CO9	Continue updating their skill related to trades.	**PO12**

REFERENCE BOOKS:

1. O.P. Arora, ―Power Electronics Laboratory: Theory, Practice and Organization (Narosa series in Power and Energy Systems)‖, Alpha Science International Ltd., 2007.
2. M. H. Rashid, ―Simulation of Electric and Electronic circuits using PSPICE‖, M/s PHI Publications.
3. PSPICE A/D user‵s manual – Microsim, USA.
4. PSPICE reference guide – Microsim, USA. 5. MATLAB and its Tool Books user‵s manual and – Math works, USA.

REFERENCE WEBSITE:

1. http://vlabs.iitb.ac.in/vlabs-ev/labs/mit_bootcamp/power_electronics/labs/index.php

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

III B.TECH V SEM

23HSM241L	**SOFTSKILLS (SKILL ENHANCEMENT COURSE)**	**L T P C**
		0 1 2 2

COURSE OBJECTIVES:

1. To encourage all round development of the students by focusing on soft skills
2. To make the students aware of critical thinking and problem-solving skills
3. To enhance healthy relationship and understanding within and outside an organization
4. To function effectively with heterogeneous teams

UNIT – I: Soft Skills & Communication Skills

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills - Significance, process, types - Barriers of communication - Improving techniques

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self- expression – articulating with felicity

(The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing-negotiating- agreeing and disagreeing with professional grace.
Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation

UNIT – II: CRITICAL THINKING

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open mindedness – Creative Thinking - Positive thinking - Reflection

Activities:

Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues –placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

UNIT – III: PROBLEM SOLVING & DECISION MAKING

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution –Team building - Effective decision making in teams – Methods & Styles

Activities:

Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision.

Case Study & Group Discussion

UNIT – IV: EMOTIONAL INTELLIGENCE & STRESS MANAGEMENT

Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations.

Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

UNIT – V: CORPORATE ETIQUETTE

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette - Corporate grooming tips - Overcoming challenges

Activities

Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

NOTE-:

1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill.
2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear.

COURSE OUTCOMES

COs	On successful completion of the course, students will be able to	POS
CO1	List out various elements of soft skills	PO1, PO2
CO2	Describe methods for building professional image Apply critical thinking skills in problem solving	PO1, PO2, PO3
CO3	Analyse the needs of an individual and team for well-being	PO1, PO2
CO4	Assess the situation and take necessary decisions	PO1, PO2, PO3
CO5	Create a productive work place atmosphere using social and work-life skills ensuring personal and emotional well-being	PO1, PO2, PO3

TEXT BOOKS:

1. Mitra Barun K, *Personality Development and Soft Skills*, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, *Personality Development and Soft Skills: Preparing for Tomorrow,* K I 2018 ,esuoH gnihsilbuP lanoitanretnI

REFERENCE BOOKS

1. Sharma, Prashant, *Soft Skills: Personality Development for Life Success*, BPB Publications 2018.
2. Alex K, *Soft Skills* S.Chand& Co, 2012 (Revised edition).
3. Gajendra Singh Chauhan& Sangeetha Sharma, *Soft Skills: An Integrated Approach to* Maximize Personality Published by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, *Soft Skills and Employability Skills,* Cambridge University Press, 2018.
5. Dr. Rajiv Kumar Jain, Dr. Usha Jain,*Life Skills* (Paperback English) Publisher: Vayu. Education of India, 2014.

Reference Website Link:

1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y- bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7Kl_J
3. https://youtu.be/-Y-R9hDl7lU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc
7. https://onlinecourses.nptel.ac.in/noc24_hs15/preview
8. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.8**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

III B. TECH V SEM

23ESC352L **TINKERING LAB**

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

1. Encourage Innovation and Creativity
2. Provide Hands-on Learning and Impart Skill Development
3. Foster Collaboration and Teamwork
4. Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship
5. Import Problem-Solving mind-set

LIST OF EXPERIMENTS: (Any nine experiments shall be done)

1. Make your own parallel and series circuits using breadboard for any application of your choice.
2. Design and 3D print a Walking Robot
3. Design and 3D Print a Rocket.
4. Temperature & Humidity Monitoring System (DHT11 + LCD)
5. Water Level Detection and Alert System
6. Automatic Plant Watering System
7. Bluetooth-Based Door Lock System
8. Smart Dustbin Using Ultrasonic Sensor
9. Fire Detection and Alarm System
10. RFID-Based Attendance System
11. Voice-Controlled Devices via Google Assistant
12. Heart Rate Monitoring Using Pulse Sensor
13. Soil Moisture-Based Irrigation
14. Smart Helmet for Accident Detection
15. Milk Adulteration Detection System
16. Water Purification via Activated Carbon
17. Solar Dehydrator for Food Drying
18. Temperature-Controlled Chemical Reactor
19. Ethanol Mini-Plant Using Biomass
20. Smart Fluid Flow Control (Solenoid + pH Sensor)
21. Portable Water Quality Tester
22. AI Crop Disease Detection
23. AI-based Smart Irrigation
24. ECG Signal Acquisition and Plotting
25. AI-Powered Traffic Flow Prediction
26. Smart Grid Simulation with Load Monitoring
27. Smart Campus Indoor Navigator
28. Weather Station Prototype
29. Firefighting Robot with Sensor Guidance
30. Facial Recognition Dustbin
31. Barcode-Based Lab Inventory System
32. Growth Chamber for Plants
33. Biomedical Waste Alert System

34. Soil Classification with AI
35. Smart Railway Gate
36. Smart Bin Locator via GPS and Load Sensors
37. Algae-Based Water Purifier
38. Contactless Attendance via Face Recognition

Note: The students can also design and implement their own ideas, apart from the list of experiments mentioned above.

Note: A minimum of 8 to 10 experiments must be completed by the students.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Design electronic circuits for variety of applications using series and parallel connections	PO1
CO2	Analyze and solve real time problems using Arduino boards	PO2
CO3	Design and analyze a real time circuit using Tinker cad	P03
CO4	Simulate and interface actuators using Arduino boards	PO4
CO5	Able to use modern simulation tools for interfacing the hardware components.	PO5
CO6	Follow ethical principles in designing, simulating and implementing various circuits.	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue updating their skill related to semiconductors implementation for various application during their life time	PO12

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	-
CO.2	-	3	-	-	-	-	-	-	-	-	-	-
CO.3	-	-	3	-	-	-	-	-	-	-	-	-
CO.4	-	-	-	3	-	-	-	-	-	-	-	-
CO.5	-	-	-	-	3	-	-	-	-	-	-	-
CO.6	-	-	-	-	-	-	-	3	-	-	-	-
CO.7	-	-	-	-	-	-	-	-	3	-	-	-
CO.8	-	-	-	-	-	-	-	-	-	3	-	-
CO.9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

III B.Tech. - V Semester

		L	T	P	C
23EEE351P	**EVALUATION OF COMMUNITY SERVICE PROJECT (Common to All Branches)**	-	-	-	2

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
2. Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
3. Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.
4. To sensitize the students to the living conditions of the people who are around them,
5. To help students to realize the stark realities of the society.
6. To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
7. To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
8. To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
9. To help students to initiate developmental activities in the community in coordination with public and government authorities.
10. To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

IMPLEMENTATION OF COMMUNITY SERVICE PROJECT

1. Every student should put in a minimum of 180 hours for the Community Service Project during the summer vacation.
2. Each class/section should be assigned with a mentor.
3. Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
4. A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.

5. The logbook has to be countersigned by the concerned mentor/faculty in-charge.
6. Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
7. The final evaluation to be reflected in the grade memo of the student.
8. The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
9. Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
10. Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

PROCEDURE

1. A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
2. The Community Service Project is a twofold one – First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.
3. Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like. Agriculture, Health, Marketing and Cooperation, Animal Husbandry, Horticulture, Fisheries, Sericulture, Revenue and Survey, Natural Disaster Management, Irrigation, Law & Order, Excise and Prohibition, Mines and Geology, Energy, Internet, Free Electricity and Drinking Water.

EXPECTED OUTCOMES

1. **Learning Outcomes:** Positive impact on student academic learning, Improves students ability to apply what they have learned in —the real world, Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development and Improved ability to understand complexity and ambiguity.
2. **Personal Outcomes:** Greater sense of personal efficacy, personal identity, spiritual growth, and moral development, Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills
3. **Social Outcomes:** Reduced stereotypes and greater inter-cultural understanding, improved social responsibility and citizenship skills, Greater involvement in community service after graduation.
4. **Career Development:** Connections with professionals and community members for learning and career opportunities, Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity.
5. **Relationship with the Institution:** Stronger relationships with faculty,

Greater satisfaction with college and Improved graduation rates.

6. **Benefits of Community Service Project to Faculty Members:** Satisfaction with the quality of student learning, New avenues for research and publication via new relationships between faculty and community, Providing networking opportunities with engaged faculty in other disciplines or institutions and A stronger commitment to one‟s research.
7. **Benefits of Community Service Project to Colleges:** Improved institutional commitment, Improved student retention and Enhanced community relations
8. **Benefits of Community Service Project to Community:** Satisfaction with student participation, Valuable human resources needed to achieve community goals, New energy, enthusiasm and perspectives applied to community work and Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

- 1. Water facilities and drinking water availability
- 2. Health and hygiene
- 3. Stress levels and coping mechanisms
- 4. Health intervention programmes
- 5. Horticulture
- 6. Herbal plants
- 7. Botanical survey
- 8. Zoological survey
- 9. Marine products
- 10. Aqua culture
- 11. Inland fisheries
- 12. Animals and species
- 13. Nutrition
- 14. Traditional health care methods
- 15. Food habits
- 16. Air pollution
- 17. Water pollution
- 18. Plantation
- 19. Soil protection
- 20. Renewable energy
- 21. Plant diseases
- 22. Yoga awareness and practice
- 23. Health care awareness programmes and their impact

- 24. Use of chemicals on fruits and vegetables
- 25. Organic farming
- 26. Crop rotation
- 27. Floury culture
- 28. Access to safe drinking water
- 29. Geographical survey
- 30. Geological survey
- 31. Sericulture
- 32. Study of species
- 33. Food adulteration
- 34. Incidence of Diabetes and other chronic diseases
- 35. Human genetics
- 36. Blood groups and blood levels
- 37. Internet Usage in Villages
- 38. Android Phone usage by different people
- 39. Utilisation of free electricity to farmers and related issues
- 40. Gender ration in schooling level-observation.

TIMELINE FOR THE COMMUNITY SERVICE PROJECT ACTIVITY

1. **Socio-Economic Survey of the Village/Habitation (Two weeks):** A group of students under the guidance of faculty mentors conduct a Socioeconomic Survey of the Village/habitation. They will interact with people to acquire basic knowledge on the project chosen for study and conduct the survey using a structured questionnaire.
2. **Community awareness campaign (one week):** The students group takes up community awareness campaigns based on the above survey conducted by identifying the problems or vulnerable issues. They may also conduct house to house campaign on socially relevant theme. Ex: Government welfare programs, health care, consumer protection, food adulteration, digital transactions, information sources, etc.
3. **Main Project (4 weeks):** A group of students choose a topic related to their subject area and conduct a Project which includes, Data collection, interviews, internship in any select unit or department.
4. **Report preparation (one week):** The student should submit a project report duly signed by the mentor.

ASSESSMENT METHODOLOGY FOR COMMUNITY SERVICE PROJECT

5. **Learning outcomes:** To facilitate an understanding of the issues that confronts the vulnerable / marginalized sections of the society. To initiate team processes with the student groups for societal change. To provide students an opportunity to familiarize themselves with urban / rural community they live in. To enable students to engage in the development of the community. To plan activities based on the focused groups. To know the ways of transforming the society through systematic programme implementation. The following is the evaluation methodology for awarding marks/grades.

   The following is the evaluation methodology for awarding marks/grades.

   There will be only internal evaluation for this internship. Each faculty member is to be assigned with 10 t0 15 students depending upon availability of the faculty members. The faculty member will act as a faculty-mentor for the group and is in-charge for the learning activities of the students and also for the comprehensive and continuous assessment of the students.

The assessment is to be conducted for 100 marks. The number of credits assigned is 4. Later as per the present practice the marks are converted into grades and grade points to include finally in the SGPA and CGPA.

The weightings shall be:

- Project Log - 20%
- Project Implementation - 30%
- Project report - 25%
- Presentation - 25%

Each student is required to maintain an individual logbook, where he/she is supposed to record day to day activities. The project log is assessed on an individual basis, thus allowing for individual members within groups to be assessed this way. The assessment will take into consideration the individual student's involvement in the assigned work.

While grading the student's performance, using the student's project log, the following should be taken into account –

a. The individual student's effort and commitment.

b. The originality and quality of the work produced by the individual student.

c. The student's integration and co-operation with the work assigned.

d. The completeness of the logbook

The assessment for the CSP implementation shall include the following components and based on the entries of Project Log and Project Report:

a. Orientation to the community development

b. Conducting a baseline assessment of development needs

c. Number and Quality of Awareness Programmes organised on beneficiary programmes and improvement in quality of life, environment and social consciousness, motivation and leadership, personality development, etc.

d. Number and Quality of Intervention Programmes (Prevention or promotion programs that aim to promote behavioral change in defined community contexts to address social problems) organized.

e. Follow-up Programmes suggested (Referral Services, Bringing Community Participation)

f. Developing short and mid-term action plans in consultation with local leadership and local government officers.

The Project Report shall be prepared as per the guidelines given in the Model Project Report. The Project Presentation is to be made by the student after he/she reports back to the College. The components for assessment are –

a. assessing the involvement in the project

b. presentation skills

c. final outcome of the project as evinced by the student.

Name of the Student:	X. YY ZZZ	
Class & Year of Study	II B.A. 2021 - 2022	
Registered Number	000000	
Assessment Component	**Max Marks**	**Marks Secured**
1. Project Log	20	15
2. Project Implementation	30	20
3. Project Report	25	20
4. Presentation	25	20
TOTAL OUT OF 100	**100**	**75**

MODEL OF THE PROJECT REPORT

PART – A

1. Introduction: A about the Village / Habitation.
2. Socio-Economic Survey of the Village/Habitation. A. Data collection using prescribed formats.
3. Problems identified and Analyses of the problems.
4. Short-term and long term action plan for possible solutions for the problems identified and that could be recommended to the concerned authorities for implementation.
5. Community awareness programmes conducted w.r.t the problems and their outcomes.

PART - B

A mini-project work in the related subject w.r.t the habitation/village. (For ex., a student of Botany may do a project on Organic Farming or Horticulture or usage of biofertilisers or bio-pesticides or effect of the inorganic pesticides, etc. A student of Zoology may do a project on Aquaculture practices or animal husbandry or poultry or health and hygiene or Blood group analysis or survey on the Hypertension or survey on the prevalence of diabetes, etc.

PART - C

1. Recommendations and conclusions.
2. References

III B.Tech. – VIth Semester

23ECE354T	MICROPROCESSORS AND MICROCONTROLLERS	L	T	P	C
		2	1	0	3

PRE-REQUISITES: Nil

COURSE OBJECTIVES:

1. To comprehend the architecture, operation, and configurations of the 8086 microprocessors.
2. To get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
3. To study the interfacing of 8086 with memory, peripherals, and controllers for various applications.
4. To learn the architecture, instruction set, and programming of the 8051 microcontrollers.
5. To understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

UNIT I - 8086 ARCHITECTURE (9)

8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT II - 8086 PROGRAMMING (9)

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT III - 8086 INTERFACING (9)

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT IV - MICROCONTROLLER (9)

Microcontroller: Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V - INTERFACING MICROCONTROLLER (9)

Interfacing Microcontroller: Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

Total Hours:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Gain knowledge on the architecture, operation, and configurations of the 8086 microprocessors.	**PO1**
CO2	Get familiar with 8086 programming concepts, instruction set, and assembly language development tools.	**PO1, PO2**
CO3	Know the interfacing of 8086 with memory, peripherals, and controllers for various applications.	**PO1, PO2**
CO4	Learn the architecture, instruction set, and programming of the 8051 microcontrollers.	**PO1, PO2**
CO5	Understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.	**PO1**

TEXT BOOKS:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.

REFERENCE BOOKS:

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning, 2004.

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	-
CO.2	3	3	-	-	-	-	-	-	-	-	-	-
CO.3	3	3	-	-	-	-	-	-	-	-	-	-
CO.4	3	3	-	-	-	-	-	-	-	-	-	-
CO.5	3	-	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

III B.Tech. – VIth Semester

23EEE361T	ELECTRICAL MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
		2	1	0	3

PRE-REQUISITES: Basic Electrical and Electronics Engineering

COURSE EDUCATIONAL OBJECTIVES:

1. To identify the principle and working of electrical measuring instruments.
2. To understand the principle of operation of instrument transformers, energy meters and analog instruments
3. To elucidate the principle and working of various DC and AC bridges for the measurement of Resistance, Inductance and Capacitance
4. To understand the principle and working of different digital voltmeters and transducers.
5. To provide knowledge on working of various sensors and data acquisition systems.

UNIT-1: MEASURING INSTRUMENTS & DIGITAL METERS (9)

Fundamentals: True Value, Errors (Gross, Systematic, Random); Static Characteristic of Instruments (Accuracy, Precision, Sensitivity, Resolution & threshold); Error Analysis- Simple problems; Statistical treatment of data-Simple problems.

Indicating Instruments: Three forces in Electromechanical indicating instrument (Deflecting, controlling & damping forces); Review of MI and MC Instruments, Electrodynamometer Type instruments: Torque equation (Expression only, no derivation), shape of scale – simple problems on torque equations; Measurement of voltage and current - Extension of Range of ammeter and voltmeter – problems on extension of range of ammeter and voltmeter.

UNIT -2: MEASUREMENT OF POWER, POWER FACTOR AND ENERGY (9)

Instrument transformers: Types, CT and PT – Ratio and phase angle errors; (Expression only, no derivation)
Measurement of power: Principle and Operation of Single-phase dynamometer wattmeter, expression (Expression only no derivation) for deflecting and control torques, errors and compensations.
Measurement of power factor: Principle and operation of Single-phase Electrodynamometer Power factor meter.
Measurement of Frequency: Principle and Operation of single-phase frequency meter- vibrating reed type- ferro dynamic type meter.
Measurement of Energy: Principle and Operation of Single-phase induction type energy meter, driving and braking torques (expression only no derivation), errors and compensations, testing by phantom loading.

UNIT-3: D.C & A.C BRIDGES: (9)

Measurement of Resistance: Methods of measuring low, medium and high resistances –

Sensitivity of Whetstone's bridge– Kelvin's double bridge for Measuring low resistance, Megger for measurement of high resistance.

Measurement of Inductance: - Maxwell's bridge, Anderson's bridge.

Measurement of Capacitance: De Sauty bridge. Wien's bridge–Schering bridge–Numerical problems.

UNIT-4: DIGITAL VOLT METERS AND TRANSDUCERS: (9)

Digital Voltmeters: Ramp type, Dual Slope integrating type, successive approximation, Potentiometric type DVMs.

Classification of transducers: Active/passive, analog/digital- Strain Gauge-gauge factor (Elementary treatment only)-applications of strain gauge, Q-Meter.

UNIT-5: TRANSDUCERS, SENSORS AND DATA ACQUISTION: (9)

Definition of Transducers, Classification of Transducers, Advantages of Electrical Transducers, Characteristics and Choice of Transducers; Principle Operation of Resistor, Inductor and Capacitive Transducers; LVDT and its Applications, Strain Gauge and Its Principle of Operation, Gauge Factor, Thermistors, Thermocouples, Piezo Electric Transducers, Photo electric Transducers, Hall effect, Photo Diodes. Optocoupler.

Silicon based micro sensors: Pressure sensor, Gyro sensor, Accelerometer, Flow sensor, Proximity sensor, Temperature sensor, Humidity sensor. (Elementary treatment only)

Introduction to PLC and SCADA Systems: Data acquisition systems (DAS) and interfacing techniques.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understood the principle and working of electrical measuring instruments	**PO1, PO2**
CO2	Demonstrated the knowledge on operation of instrument transformers, energy meters and analog instruments	**PO1, PO2, P03**
CO3	Investigated the principle and working of various DC and AC bridges for the measurement of Resistance, Inductance and Capacitance	**PO1, PO2, P03**
CO4	Analyzed the Operation of principle and working of different digital voltmeters and transducers.	**PO1, PO2, P03**
CO5	Explored the knowledge on working of various sensors and data acquisition systems	**PO1, PO2, P03,PO4**

TEXT BOOKS:

1. Electrical & Electronic Measurement & Instruments by A.K. Sawhney Dhanpat Rai & Co. Publications, 2007.
2. Electrical Measurements and measuring Instruments–by E.W.Golding and F.C. Widdis, 5th Edition, Reem Publications, 2011.
3. Buckingham and Price, ―Electrical Measurements‖, Prentice – Hall

REFERENCE BOOKS:

1. Electronic Instrumentation by H.S.Kalsi,Tata Mcgrawhill, 3rd Edition, 2011.
2. Electrical Measurements: Fundamentals, Concepts, Applications–by Reissl and, M.U, New Age International (P) Limited, 2010.
3. Electrical & Electronic Measurement & Instrumentation by R.K.Rajput, 2nd Edition, S. Chand & Co., 2nd Edition, 2013.
4. Sensor Technology: Hand Book by JonS. Wilson, ELSEVIER publications,2005.

REFERNCE LINK:
https://onlinecourses.nptel.ac.in/noc22_ee112/preview

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	**2**	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**2**	**2**								

III B.Tech. – VIth Semester

23EEE362T	POWER SYSTEM ANALYSIS	L	T	P	C
		2	1	0	3

PRE-REQUISITES: Network Analysis

COURSE EDUCATIONAL OBJECTIVES:

1. The use of per unit values and graph theory concepts, solving a problem using computer
2. Formation of Ybus and Zbus of a Power System network, power flow studies by various methods
3. Different types of faults and power system analysis for symmetrical and also unsymmetrical faults
4. Inculcate the short circuit studies of different fault conditions.
5. Analysis of power system for steady state and transient stability and also methods to improve stability

UNIT-1: PER-UNIT SYSTEM AND YBUS FORMATION: (9)

Per-Unit representation of Power system elements - Per-Unit equivalent reactance network of a three phase Power System - Graph Theory: Definitions, Bus Incidence Matrix, Y Bus formation by Direct and Singular Transformation Methods, Numerical Problems.

UNIT -2: FORMATION OF ZBUS: (9)

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

UNIT-3: POWER FLOW ANALYSIS: (9)

Static load flow equations – Load flow solutions using Gauss Seidel Method: Algorithm and Flowchart. Acceleration Factor, Load flow Solution for Simple Power Systems (Max. 3-Buses): Newton Raphson Method in Polar Co-Ordinates Form: Load Flow Solution- Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods.- Comparison of Different Methods

UNIT-4: SHORT CIRCUIT STUDIES: (9)

Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors. Symmetrical Component Theory: Positive, Negative and Zero sequence components, Positive, Negative and Zero sequence Networks. Symmetrical Fault Analysis: LLLG faults with and without fault impedance, Unsymmetrical Fault Analysis: LG, LL and LLG faults with and without fault impedance, Numerical Problems.

UNIT-5: STABILITY ANALYSIS: (9)

Elementary concepts of Steady State, Dynamic and Transient Stabilities. Derivation of Swing Equation, Power Angle Curve and Determination of Steady State Stability. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation. Numerical methods for solution of swing equation - Methods to improve

Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Remember and understand the concepts of per unit values, Y Bus and Z bus formation, load flow studies, symmetrical and unsymmetrical fault calculations.	**PO1, PO2,PO3**
CO2	Apply the concepts of good algorithm for the given power system network and obtain the converged load flow solution and experiment some of these methods using modern tools and examine the results.	**PO1, PO2, P03**
CO3	Analyse the symmetrical faults and unsymmetrical faults and done the fault calculations, analyse the stability of the system and improve the stability.	**PO1, PO2, P03**
CO4	Demonstrate the use of these techniques through good communication skills	**PO1, PO2, P03**
CO5	Develop accurate algorithms for different networks and determine load flow studies and zero,positive and negative sequence impedances to find fault calculations	**PO1, PO2, P03,PO4,PO5**

TEXT BOOKS:

1. Computer Methods in Power System Analysis by G.W.Stagg and A.H.El-Abiad, Mc Graw-Hill, 2006.
2. Modern Power system Analysis by I.J.Nagrath&D.P.Kothari, Tata McGraw-Hill Publishing Company, 4th Edition, 2011.

REFERENCE BOOKS:

1. Power System Analysis by Grainger and Stevenson, McGraw Hill, 1994.
2. Power System Analysis by Hadi Saadat, McGraw Hill, 1998.
3. Power System Analysis and Design by B.R.Gupta, S. Chand & Company, 2005

REFERNCE LINK

https://onlinecourses.nptel.ac.in/noc22_ee120/preview

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	2	2	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**2**	2	2							

23EEE363A	AI & ML for ELECTRICAL ENGINEERING (Professional Elective-II)	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. Understanding the Basics and Architecture of Artificial Intelligence
2. Analyzing and Applying Artificial Neural Networks (ANN) Concepts -n
3. Implementing ANN Applications in Real-World Problems
4. Understanding and Applying Fuzzy Logic Concepts
5. Designing and Implementing Fuzzy Logic Applications

UNIT-1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE: (9)

Introduction and motivation - Approaches to AI - Architectures of AI - Symbolic Reasoning System - Rule based Systems - Knowledge Representation - Expert Systems.

UNIT -2: OVERVIEW OF MACHINE LEARNING: (9)

The Motivation & Applications of Machine Learning: Learning Associations, Classification, Regression; Supervised Learning; Unsupervised Learning; Reinforcement Learning; Gradient Descent: Batch Gradient Descent, Stochastic Gradient Descent; Data preprocessing; Under fitting and Overfitting issues

UNIT-3: ARTIFICIAL NEURAL NETWORKS: (9)

Basics of ANN - Comparison between Artificial and Biological Neural Networks - Basic Building Blocks of ANN - Artificial Neural Network Terminologies - McCulloch Pitts Neuron Model - Learning Rules - ADALINE and MADALINE Models - Perceptron Networks (Continuous and Discrete) – Perceptron Convergence Theorem - Back Propagation Neural Networks - Associative Memories – BAM and Hopfield networks.

UNIT-4: FUZZY LOGIC: (9)

Classical Sets - Fuzzy Sets - Fuzzy Properties, Operations and relations - Fuzzy Logic System - Fuzzification - Defuzzification - Membership Functions - Fuzzy Rule base - Fuzzy Logic Controller Design

UNIT-5: STABILITY ANALYSIS: (9)

Load forecasting, Load flow studies, Economic load dispatch, Speed control of DC Motor, Speed Control of Induction Motors

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understanding the Basics and Architecture of Artificial Intelligence	**PO1, PO2,PO3**
CO2	Analyzing and Applying Artificial Neural Networks (ANN) Concepts -n	**PO1, PO2, P03**
CO3	Implementing ANN Applications in Real-World Problems	**PO1, PO2, P03**
CO4	Understanding and Applying Fuzzy Logic Concepts	**PO1, PO2, P03**
CO5	Designing and Implementing Fuzzy Logic Applications.	**PO1, PO2, P03**

TEXT BOOKS:

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Neural Networks using MATLAB", McGraw Hill Edition, 2006.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", Third Edition, WILEY India Edition, 2012.
3. Ethem Alpaydin, ―Introduction to Machine Learning‖, MIT Press, 3rd edition, 2014
4. Russell**.** S and Norvig. P, ―Artificial Intelligence - A Modern Approach‖, 4 th edition,Pearson, 2022

REFERENCE BOOKS:

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer International Edition, 2013.
2. Yung C. Shin and Chengying Xu, "Intelligent System - Modeling, Optimization & Control, CRC Press, 2009.
3. Kevin P. Murphy, ―Machine Learning: A Probabilistic Perspective‖, MIT Press, 2012

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**2**									

III B.Tech. – VIth Semester

23EEE363C	PROGRAMMABLE LOGIC CONTROLLERS (Professional Elective-II)	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

The student will be able to:

1. Understand the basic functions and types of PLCs, Easy Veep software, its applications
2. Understand Classification of PLCs and applications
3. Design PLC Programming for various applications
4. Analyze PLC Troubleshooting aspects

UNIT-1: INTRODUCTION TO PLCS: (9)

Basic functions of PLCs, Mechanical relays versus PLC, Different types of PLC's – Allen-Bradley – Micrologix: ML1000, ML1100, SLC500, Compact Logix, Mitsubishi FX series, HMI's, Processor and I/O cards

UNIT -2: PLC COMPUTATIONAL TOOL: (9)

Introduction to Easy Veep software, Link between mechanical, electrical and programming documentation, Logic diagrams, Flip-Flop Logic, M8000, M8001 internal bits interpretation, Binary code, data table, manipulation and search engine in Mitsubishi environment Communication between PC and PLC, Communication between PC and HMI, PLC and HMI Serial Local network, Introduction to SLC500

UNIT-3: PLC DEVELOPMENT: (9)

PLC software and applications, Boolean algebra – understanding binary code, ADD and SUB functions, UP and Down Counters, Introduction to k1Y0, MOV function, CPR and ZCP functions, SHWT and SHRD instructions, Introduction to Absolutely Drum Instruction. Allen Bradley PLC: Introduction to Rockwell Software, Hardware focus, Hardware considerations (Field wiring, Master Control Relay, VFD),Basic programming and applications, Cascade control – subroutine, Different programs

UNIT-4: FUZZY LOGIC: (9)

Programming instructions: Instructions and binary interpretation, Bit Instruction, Timers and counters, Comparison instructions, Programming Instructions - Math instructions, Move and Logical Instructions, Discussions of programming, communications for PLC-Robotic arm, Exercise of setup and monitoring.

UNIT-5: STABILITY ANALYSIS: (9)

Analog and Digital parameters by using SLC5/03-VFD-Panel Mate series 1700, Practical Troubleshooting, troubleshooting technique, Control system stability and tuning basics. Applications: Process to rewind, test, and integrate with extrusion process for wiring and fibre optic industries, Food industry – yeast, flour distribution and control. Process Medical equipment Industry

– Gas analyzer, Leak tester (using CO2), plastic wrapping machines etc

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand different types of PLCs, Its classification and the usage of Easy Veep software	**PO1, PO2,PO3**
CO2	Analyze the hardware details of Allen Bradley PLC	**PO1, PO2, P03**
CO3	Design PLC Programming for various applications	**PO1, PO2, P03**
CO4	Apply PLC programming concepts in different fields of Science and Technology	**PO1, PO2, P03**
CO5	Develop Instruction using ADD and SUB functions, UP and Down counters	**PO1, PO2, P03**

TEXT BOOKS:

1. Automating manufacturing systems with PLCs by Hugh Jack, 2010.
2. PLC Hand Book (Automation direct Siemens)

REFERENCE BOOKS:

1. Programmable Logic Controllers by R. Bliesener, F Ebel, Festo. Didactic publishers, 2002.
2. Programmable Logic Controllers by W. Bolton, 4th Edition, Newnes, 2006.
3. Introduction to PLCs by Jay F. Hooper, 2nd Edition, Carolina Academic Press, 2006

REFERNCE LINK

https://nptel.ac.in/courses/108105088

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**2**									

23EEE363D	SWITCHGEAR AND PROTECTION (Professional Elective-II)	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. The study of different Circuit Breakers and Relays.
2. The protection of Generators and Transformers.
3. To discuss the causes of abnormal operating conditions (faults, lightning and switching surges) of the apparatus and system.
4. The protection of various feeder bus bars from abnormal conditions and over voltages & importance on neutral grounding for overall protection

UNIT-1: CIRCUIT BREAKERS: (9)

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

UNIT-2: ELECTROMAGNETIC, STATIC AND NUMERICAL RELAYS: (9)

Basic Requirements of Relays – Primary and Backup protection - Construction details of – Attracted armature, balanced beam, inductor type and differential relays – Universal Torque equation – Characteristics of over current, Direction and distance relays. Static Relays – Advantages and Disadvantages – Definite time, Inverse and IDMT static relays – Comparators – Amplitude and Phase comparators. Microprocessor based relays – Advantages and Disadvantages – Block diagram for over current (Definite, Inverse and IDMT), Distance Relays, Impedance Relays and Reactance Relays with their Flow Charts.

UNIT-3 PROTECTION OF GENERATORS AND TRANSFORMERS: (9)

Protection of generators: Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on percentage winding unprotected. Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CTs Ratio, Buchholtz relay Protection

UNIT-4: PROTECTION OF FEEDERS, TRANSMISSION LINES AND BUSBARS (9)

Protection of Feeders (Radial & Ring main) using over current Relays. Protection of Transmission lines – 3 Zone protection using Distance Relays. Carrier current protection. Protection of Bus bars - Differential protection, Differential Pilot wire protection

UNIT-5: PROTECTION AGAINST OVER VOLTAGES (9)

Generation of Over Voltages in Power Systems. -Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination –BIL. 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

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand different types of PLCs, Its classification and the usage of Easy Veep software	PO1, PO2,PO3
CO2	Analyze the hardware details of Allen Bradley PLC	PO1, PO2, P03
CO3	Design PLC Programming for various applications	PO1, PO2, P03
CO4	Apply PLC programming concepts in different fields of Science and Technology	PO1, PO2, P03
CO5	Develop Instruction using ADD and SUB functions, UP and Down counters	PO1, PO2, P03

TEXT BOOKS:

1. Switchgear and Protection – by Sunil S Rao, Khanna Publishers.
2. Power System Protection and Switchgear by Badari Ram, D.N Viswakarma, TMH Publications.

REFERENCE BOOKS:

1. Protective Relaying Principles and Applications – J Lewis Blackburn, CRC Press.
2. Numerical Protective Relays, Final Report 2004 – 1009704 EPRI, USA.
3. Protective Relaying Theory and Applications - Walter A Elmore, Marcel Dekker.
4. Transmission network Protection by Y.G. Paithankar, Taylor and Francis, 2009.
5. Power System Protection- P. M. Anderson, Wiley Publishers.

REFERNCE LINK

https://onlinecourses.nptel.ac.in/noc22_ee101/preview

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.6**	**2**									

23EEE363E	SYSTEM THEORY	L T P C
	(Professional Elective-II)	3 0 0 3

Pre-requisite: A course on control system engineering

COURSE EDUCATIONAL OBJECTIVES:

1. Understand the fundamentals of physical systems in terms of its linear and
2. nonlinear models.
3. Educate on representing systems in state variable form
4. Educate on solving linear and non-linear state equations
5. Exploit the properties of linear systems such as controllability and observability
6. Educate on stability analysis of systems using Lyapunov's theory

UNIT - 1: STATE VARIABLE REPRESENTATION: (9)

Introduction-Concept of State-State equations for Dynamic Systems -Time invariance and linearity- Non uniqueness of state model- Physical Systems and State Assignment – free and forced responses- State Diagrams.

UNIT –2: SOLUTION OF STATE EQUATIONS: (9)

Existence and uniqueness of solutions to Continuous-time state equations – Solution of Nonlinear and Linear Time Varying State equations – State transition matrix and its properties – Evaluation of matrix exponential- System modes- Role of Eigen values and Eigen vectors.

UNIT-3: STABILITY ANALYSIS OF LINEAR SYSTEMS: (9)

Controllability and Observability definitions and Kalman rank conditions -Stabilizability and Detectability-Test for Continuous time Systems- Time varying and Time invariant case- Output Controllability-Reducibility- System Realizations.

UNIT-4: STATE FEEDBACK CONTROL AND STATE ESTIMATOR: (9)

Introduction-Controllable and Observable Companion Forms-SISO and MIMO Systems- The Effect of State Feedback on Controllability and Observability-Pole Placement by State Feedback for both SISO and MIMO Systems-Full Order and Reduced Order Observers.

UNIT-5: LYAPUNOV STABILITY ANALYSIS: (9)

Introduction-Equilibrium Points- BIBO Stability-Stability of LTI Systems- Stability in the sense of Lyapunov – Equilibrium Stability of Nonlinear Continuous-Time Autonomous Systems-The Direct Method of Lyapunov and the Linear Continuous-Time Autonomous Systems-Finding Lyapunov Functions for Nonlinear Continuous-Time Autonomous Systems – Krasovskil's and Variable-Gradiant Method.

TOTAL: 45 Hours

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos & PSOs
CO1	Represent the time-invariant systems in state space form as well as analyze the system is stabilizable.	**PO1,PO2,PO3,PO4**
CO2	Design state feedback controller and state observers	**PO1,PO2,PO3,PO4**
CO3	Classify the linear and non-linear state equations	**PO1,PO2**
CO4	Analyze the stability of certain class of non-linear system.	**PO1,PO2**
CO5	Describe non-linear behaviors such as Limit cycles, input multiplicity and output multiplicity, Bifurcation and Chaos.	**PO1,PO2,PO3**

TEXT BOOKS:

1. M. Gopal, "Modern Control System Theory", New Age International, 2005.
2. K. Ogatta, "Modern Control Engineering", PHI, 2002.
3. John S. Bay, "Fundamentals of Linear State Space Systems", McGraw-Hill, 1999.

REFERENCE BOOKS:

1. D. Roy Choudhury, "Modern Control Systems", New Age International, 2005.
2. John J. D'Azzo, C. H. Houpis and S. N. Sheldon, "Linear Control System Analysis and Design with MATLAB", Taylor Francis, 2003.
3. Z. Bubnicki, "Modern Control Theory", Springer, 2005.
4. C.T. Chen, "Linear Systems Theory and Design'' Oxford University Press, 3rd Edition,1999.
5. M. Vidyasagar, "Nonlinear Systems Analysis', 2nd edition, Prentice Hall, Englewood Cliffs, New Jersey.

REFERENCE WEBSITE LINK:

https://www.edx.org/search?q=CONTROL%20SYTEM%20ENGINEERING

CO-PO MAPPING:

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

III B.Tech. – VIth Semester

23EEE364A	**ELECTRIC DRIVES (Professional Elective-III)**	**L T P C** **3 0 0 3**

PRE-REQUISITES: Power Electronics

COURSE EDUCATIONAL OBJECTIVES:

1. To Evaluate the characteristics and operational aspects of drives operating in different modes.
2. To analyze the operational aspects of various controlled rectifiers fed DC drives operating in different sustainable modes of operation.
3. To understand the operational aspects of various controlled chopper fed DC drives operating in different sustainable modes of operation.
4. To Analyze the operational aspects of various asynchronous motor drives operating in different sustainable modes of operation.
5. To Understand the operational aspects of synchronous motor and stepper motor drives operating in different sustainable modes of operation.

UNIT-1: INTRODUCTION TO ELECTRIC DRIVES: (9)

Electrical drives — block diagram, advantages of electric drive, parts of electric drives, choice of electrical drives, the status of DC and AC drives. Dynamics of electrical drives-fundamental torque equations, speed- torque conventions, and multi-quadrant operation; Equivalent values of drive parameters - loads with rotational and translational motion; Load torques — components, nature and classification. Concept of steady-state stability. Electric braking methods — regenerative, dynamic and plugging. Modes of operation of electrical drives — steady state, acceleration including starting and deceleration including stopping. Speed control and drive classifications, closed-loop control of drives — current limit control, torque control, speed control and position control (Block diagram only).

UNIT -2: SINGLE-PHASE AND THREE PHASE CONVERTER FED DC DRIVES: (9)

Control of DC separately excited motor by single-phase and three-phase half and full bridged converters — voltage and current waveforms for continuous and discontinuous conduction, speed-torque expressions and characteristics. Single phase half-controlled rectifier fed DC series motor — voltage and current waveforms for continuous and discontinuous conduction, speed-torque expressions and characteristics. Multi-quadrant operation of DC separately excited DC motor fed from fully controlled rectifier - mechanical reversible switch in armature, dual converter and field current reversal.

UNIT-3: DC CHOPPER FED DRIVES: (9)

Control of DC separately excited motor by one, two and four quadrant choppers - voltage and current waveforms for continuous conduction (motoring, regenerative and dynamic braking), speed-torque expressions and characteristics. Chopper control of DC series motor—operation, speed-torque expressions and characteristics. Closed loop chopper control of separately excited DC motor (Block diagram only).

UNIT-4: INDUCTION MOTOR DRIVES: (9)

Three phase induction motors — Introduction, Stator variable voltage control — speed-torque characteristics, AC voltage controllers and efficiency of induction motor under voltage control. Stator variable voltage and variable frequency control — slip speed control, torque-power limitations and modes of operation. Voltage Source Inverters (VSIs) and Current Source Inverters (CSIs) fed induction motor and closed loop operation of induction motor drives (Block diagram only). Comparison of VSI and CSI fed drives. Static rotor resistance control, slip power recovery schemes – static scherbius and kramer drive, speed-torque characteristics.

UNIT-5: SYNCHRONOUS AND STEPPER MOTOR DRIVES: (9)

Synchronous Motor Drives: Separate control and self-control of synchronous motors — operations of self- controlled synchronous motors by VSI and CSI. Load commutated CSI fed Synchronous motor—operation and speed torque characteristics. Closed loop control operation of synchronous motor drives (Block diagram only). Stepper Motor Drives: Variable reluctance and permanent magnet operation — features of stepper motor — torques Vs stepping rate characteristics and drive circuits. BLDC motor operation and control.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Evaluate the characteristics and operational aspects of drives operating in different modes	PO1, PO2,PO3
CO2	Analyze the operational aspects of various controlled rectifiers fed DC drives operating in different sustainable modes of operation.	PO1, PO2, P03
CO3	Analyze the operational aspects of various controlled chopper fed DC drives operating in different sustainable modes of operation	PO1, PO2, P03
CO4	Analyze the operational aspects of various asynchronous motor drives operating in different sustainable modes of operation	PO1, PO2, P03
CO5	Analyze the operational aspects of synchronous motor and stepper motor drives operating in different sustainable modes of operation	PO1, PO2, P03

TEXT BOOKS:

1. Gopal K. Dubey, Fundamentals of Electric Drives, Narosa Publications, Alpha Science International Ltd, 2 nd Edition, 2002.
2. M. H. Rashid (2003), Power Electronic Circuits, Devices and applications, 3rd edition, Prentice Hall of India, New Delhi, India.
3. Krishnan, Ramu. Electric motor drives: modeling, analysis, and control, 1st Edition, Pearson, 2015.

REFERENCE BOOKS:

1. M. D. Singh, K. B. Khanchandani (2008), Power Electronics, 2nd Edition, Tata McGraw Hill Publications, New Delhi.
2. Vedam Subramanyam (2008), Thyristor Control of Electric drives, 1st Edition, Tata McGraw Hill Publications, New Delhi, India.S. K. Pillai (2007), A First course on Electrical Drives, 2nd Edition, New Age International (P) Ltd.,NewDelhi.

3. P.C. Sen, Principles of Electrical Machines and Power Electronics, Wiley, 3rdEdition, 2013.

REFERNCE LINK

1. https://web.iitd.ac.in/~amitjain/Drives_VTR.pdf
2. https://sde.uoc.ac.in/sites/default/files/sde_videos/Electrical%20Drives%20and%20Controls_0.pdf

CO-PO MAPPING:

CO/PO	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	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2**									

III B.Tech. – VIth Semester

		L	T	P	C
23EEE364B	**POWER SYSTEM DYNAMICS (Professional Elective Course-3)**	**3**	**0**	**0**	**3**

PRE-REQUISITES: A Course on Electrical Machines

COURSE EDUCATIONAL OBJECTIVES:

1. Introduce the basics of dynamics and stability problems.
2. Educate on modelling of synchronous machines.
3. Educate on the excitation system and speed-governing controllers.
4. Study small signal stability of a single machine infinite bus system with excitation
5. System and power system stabilizer.
6. Educate on the transient stability simulation of multi machine power system.

UNIT -1: BASIC CONCEPTS (9)

Power system stability- states of operation and system security - system dynamics – problems - system model – analysis of steady state stability and transient stability – simplified representation of excitation control.

UNIT-2: MODELING OF SYNCHRONOUS MACHINE (9)

Synchronous machine – Park's transformation – analysis of steady state performance – per unit quantities- Equivalent circuits of synchronous machine – Determination of parameters of equivalent circuits.

UNIT-3: EXCITATION SYSTEM (9)

Excitation system modeling – block diagram – system representation by state equations – dynamics of a synchronous generator connected to infinite bus – system model – Synchronous machine model – stator and rotor equations – Synchronous machine model with field circuit.

UNIT-4: ANALYSIS OF SINGLE MACHINE SYSTEM (9)

Small signal analysis with block diagram – Representation characteristic equation and application of Routh Hurwitz criterion - synchronizing and damping torque analysis – small signal model – State equations.

UNIT-5: APPLICATION OF POWER SYSTEM STABILIZERS (9)

Basic concepts in applying PSS – Control signals – Structure and tuning of PSS – Washout

Total Hours: 45

COURSE OUTCOME

On successful completion of the course, students will be able to		Pos & PSOs
CO1	Demonstrate knowledge on fundamental dynamic behavior of power systems	**PO1,PO2,PO3**
CO2	Acquire knowledge on synchronous machine modeling	**PO1,PO3**
CO3	Demonstrate knowledge on excitation system modeling	**PO1,PO3**
CO4	Acquire knowledge on analyzing single machine system	**PO1,PO2,PO3**
CO5	Demonstrate knowledge on application of power system stabilizers	**PO1,PO2**

TEXT BOOKS:

1. K R Padiyar, "Power Systems Dynamics", B.S. publications.
2. P M Anderson and A A Fouad, "Power system control and stability", IEEE Press

REFERENCE BOOKS:

1. R Ramanujam, "Power Systems Dynamics", PHI publications.
2. P Kundur, "Power system stability and control", McGraw Hill publishers

REFERENCE WEBSITE LINK:

https://nptel.ac.in/courses/108/101/108101004/

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-
CO*	**2.8**	**2.6**	**2**									

III B.Tech. – VIth Semester

23EEE364C	RENEWABLE AND DISTRIBUTED ENERGY TECHNOLOGIES (Professional Elective-III)	L	T	P	C
		3	0	0	3

PRE-REQUISITES:

COURSE EDUCATIONAL OBJECTIVES:

1. To explores each of the principal renewable energy sources in turn.
2. To know the different technology is examined in terms of the relevant physical principles potential renewable resource.
3. This Distributed Generation course is intended.
4. To provide knowledge of the benefits of renewable energy generation, availability of distributed generation technology, electricity generation technologies, issues related to grid interconnection.
5. To analyzing the methods of technical and economic feasibility

UNIT-1: ENERGY SCENARIO AND SOLAR ENERGY: (9)

Introduction: Fundamentals of renewable energy sources, Types of energy, Renewable and Non-renewable energy, SWOT analysis, Global warming and climate change, World energy transformation by 2050, Prospects of renewable energy in the world, Renewable energy availability in India.

Solar Energy Fundamentals: Solar Spectrum, propagation of solar radiation from the sun to earth; solar radiation geometry: sun-earth geometry, extra-terrestrial and terrestrial radiation.

Solar Thermal: Solar Collectors, Solar parabolic trough, Solar tower, Solar cooker, Solar water heater, Solar dryer, Solar Pond.

Solar Electric Power Generation: A Generic PV Cell, PV Materials, Equivalent Circuits for PV Cells, Modules and Arrays; I-V Curve under Standard Testing Conditions; Impact of Temperature and Insolation on I-V curves; Shading Impacts on I-V curves; Maximum Power Point Trackers (MPPT).

UNIT-2: WIND AND OTHER ENERGY SYSTEMS: (9)

Wind Energy: Air, Wind, Global and Local Wind, availability of wind energy in India, wind velocity and power from wind; major problems associated with wind power, Classification of wind energy conversion system (WECS)- Horizontal axis- single, double and multiblade system. Vertical axis- Savonius and darrieus types.

Biomass Energy: Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies-fixed dome; Urban waste to energy conversion; Biomass gasification (Downdraft).

Tidal Power: fundamental characteristics of tidal power, harnessing tidal energy, advantages, and limitations

UNIT-3: ENERGY STORAGE AND GREEN ENERGY: (9)

Energy Storage: Stationary Battery Storage – Basics of Lead-Acid batteries, Battery Storage Capacity, Coulomb efficiency instead of energy efficiency, Battery Sizing. Different Battery storage technologies and comparison of their performance.

Introduction to Super capacitors.

Green Energy: Historical Development, Basic Operation of a Fuel Cell, Fuel Cell Thermodynamics, Entropy and the theoretical efficiency of Fuel Cells, Gibbs Free Energy and Fuel Cell efficiency, Electrical output of an Ideal Cell, Electrical Characteristics of Real Fuel Cells, Types of Fuel Cells, H2: Operating principles, Zero energy Concepts. Benefits of hydrogen energy, hydrogen production technologies (electrolysis method only), hydrogen energy storage, applications of hydrogen energy, problem associated with hydrogen energy.

UNIT-4: Introduction to DG and its Grid Integration (9)

Introduction: Need for Distributed generation, renewable sources in distributed generation, current scenario in Distributed Generation, Planning of DGs – Siting and sizing of DGs – optimal placement of DG sources in distribution systems.

Grid integration of DGs: Different types of interfaces - Inverter based DGs and rotating machine-based interfaces - Aggregation of multiple DG units. Energy storage elements: Batteries, ultracapacitors, flywheels.

UNIT-5: Technical Impact, Economic and Control aspects of DG (9)

Technical impacts of DGs: Transmission systems, Distribution systems, De-regulation – Impact of DGs upon protective relaying – Impact of DGs upon transient and dynamic stability of existing distribution systems

Economic and control aspects of DGs: Market facts, issues, and challenges - Limitations of DGs. Voltage control techniques, Reactive power control, Harmonics, Power quality issues. Reliability of DG based systems – Steady-state and Dynamic analysis.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Comprehend the renewable energy scenario, anticipate future energy demand and to understand the abstraction concept of electrical energy from Solar Energy	**PO1, PO2,PO3**
CO2	Understand the abstraction concept of electrical energy from wind, bio-mass and Tidal energy sources	**PO1, PO2, P03**
CO3	Understand electrical energy storage along with working of Green Energy	**PO1, PO2, P03**
CO4	Exemplify rudimentary idea of Distributed Generation	**PO1, PO2, P03**
CO5	Comprehend the technical impact, control, and economic aspects of Distributed Generation	**PO1, PO2, P03**

TEXT BOOKS:

1. Muhammad Kamran, Muhammad Rayyan Fazal, "Renewable Energy Conversion Systems", First Edition, Elsevier Academic Press, 2021.
2. G. D. Rai, Non-Conventional Sources of Energy, Khanna Publisher, 2004

REFERENCE BOOKS:

1. G N Tiwari, Solar Energy: Fundamentals, Design, Modeling and Applications, Narosa, 2002.
2. Mukund R Patel, Wind and Solar Power Systems: Design, Analysis, and Operation, 2nd Edition, Taylor & Francis, 2006.

3. H. Lee Willis, Walter G. Scott, ―Distributed Power Generation – Planning and Evaluation‖, Marcel Decker Press, 2000.
4. Gilbert M. Masters, ―Renewable and Efficient Electric Power Systems‖, 2nd Edn., IEEE Press, Wiley, 2013.
5. N. Jenkins, J.B. Ekanayake and G. Strbac, ―Distributed Generation‖, 1st Edn, The Institution of Engineering and Technology, London, 2010.

REFERNCE LINK:

1. https://archive.nptel.ac.in/courses/121/106/121106014/#
2. https://onlinecourses.nptel.ac.in/noc22_ch27/preview
3. https://www.nptelvideos.com/lecture.php?id=8517

CO-PO Mapping:

CO/PO	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	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2**									

III B.Tech. – VIth Semester

23ECE365A	COMMUNICATION SYSTEMS (PROFESSIONAL ELECTIVE III)	L T P C
		3 0 0 3

PRE-REQUISITES: Nil

COURSE OBJECTIVES:

1. To understand the fundamentals of communication systems and amplitude modulation techniques.
2. To learn about the angle modulation techniques and bandwidth considerations in communication systems.
3. To gain knowledge on pulse analog modulation and multiple access techniques used in digital communication systems.
4. To examine pulse modulation and digital modulation techniques used in modern communication systems.
5. To study wireless communication systems, cellular networks, and GSM technology.

UNIT I - ANALOG COMMUNICATION-I (9)

Elements of communication systems, need for Modulation, Modulation Methods, Baseband and carrier communication Amplitude Modulation (AM), Generation of AM signals, Rectifier detector, Envelope detector, sideband and carrier power of AM, Double side band suppressed carrier (DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Single sideband (SSB) transmission, VSB Modulation.

UNIT II - ANALOG COMMUNICATION-II (9)

Angle Modulation & Demodulation: Concept of instantaneous frequency Generalized concept of angle modulation, Bandwidth of angle modulated waves- Narrow band frequency modulation (NBFM); and Wide band FM (WBFM), Phase modulation, Pre-emphasis & De-emphasis, Illustrative Problems.

UNIT III - DIGITAL COMMUNICATIONS-I (9)

(Qualitative Approach only) Pulse analog modulation techniques, Generation and detection of Pulse amplitude modulation, Pulse width modulation, Pulse position modulation

Multiple Access Techniques: Introduction to multiple access techniques, FDMA, TDMA, CDMA, SDMA: Advantages and applications

UNIT IV - DIGITAL COMMUNICATIONS-II (9)

(Qualitative Approach only): Pulse Code Modulation, DPCM, Delta modulation, Adaptive delta modulation, Overview of ASK, PSK, QPSK, BPSK and M-PSK techniques.

UNIT V - WIRELESS COMMUNICATIONS (9)

(Qualitative Approach only): Introduction to wireless communication systems, Examples of wireless communication systems, comparison of 2G and 3G cellular networks, Introduction to wireless networks, Differences between wireless and fixed telephone networks, Introduction to Global system for mobile (GSM), GSM services and features.

Total Hours:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand the fundamentals of communication systems and amplitude modulation techniques.	**PO1**
CO2	Learn about the angle modulation techniques and bandwidth considerations in communication systems.	**PO1, PO2**
CO3	Gain knowledge on pulse analog modulation and multiple access techniques used in digital communication systems.	**PO1, PO2, PO3**
CO4	Get familiar with pulse modulation and digital modulation techniques used in modern communication systems.	**PO1, PO2,P03**
CO5	Know about wireless communication systems, cellular networks, and GSM technology.	**PO1,PO2**

TEXT BOOKS

1. H Taub, D. Schilling and Gautam Sahe, "Principles of Communication Systems", TMH, 2007, 3rd Edition.
2. George Kennedy and Bernard Davis, "Electronics & Communication System", 4th Edition, TMH 2009.
3. Wayne Tomasi, "Electronic Communication System: Fundamentals Through Advanced", 2nd edition, PHI,2001.

REFERENCE BOOKS

1. Simon Haykin, "Principles of Communication Systems", John Wiley, 2nd Edition.
2. Sham Shanmugam, "Digital and Analog communication Systems", Wiley-India edition,2006.
3. Theodore. S.Rapport, "Wireless Communications", Pearson Education, 2nd Edition,2002.

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	-
CO.2	3	3	-	-	-	-	-	-	-	-	-	-
CO.3	3	3	2	-	-	-	-	-	-	-	-	-
CO.4	3	2	2	-	-	-	-	-	-	-	-	-
CO.5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.5**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

III B TECH. - V SEMESTER

230CE361A	**DISASTER MANAGEMENT**	**L T P C**
	(OPEN ELECTIVE – II)	**3 0 0 3**

COURSE EDUCATIONAL OBJECTIVES

1. To understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.
2. To analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.
3. To apply wind engineering principles and computational techniques in designing wind-resistant structures.
4. To evaluate earthquake effects on buildings and develop strategies for seismic retrofitting.
5. To assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.

UNIT–1 **(9)**

Introduction to Natural Disasters– Brief Introduction to Different Types of Natural Disasters, Occurrence of Disasters in different Climatic and Geographical Regions, Hazard Maps (Earthquake and Cyclone) of The World and India, Regulations for Disaster Risk Reduction, Post-Disaster Recovery and Rehabilitation (Socioeconomic Consequences).

UNIT–2 **(9)**

Cyclones and Their Impact– Climate Change and Its Impact On Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and Landslides. Behavior of Structures in Past Cyclones and Windstorms, Case Studies. Cyclonic Retrofitting, Strengthening of Structures, and Adaptive Sustainable Reconstruction. Life-Line Structures Such as Temporary Cyclone Shelters.

UNIT–3 **(9)**

Wind Engineering and Structural Response– Basic Wind Engineering, Aerodynamics of Bluff Bodies, Vortex Shedding, and Associated Unsteadiness Along and Across Wind forces. Lab: Wind Tunnel Testing and Its Salient Features. Introduction to Computational Fluid Dynamics (CFD). General Planning and Design Considerations Under Windstorms and Cyclones. Wind Effects On Buildings, towers, Glass Panels, Etc., and Wind-Resistant Features in Design. Coda Provisions, Design Wind Speed, Pressure Coefficients. Coastal Zoning Regulations for Construction and Reconstruction in Coastal Areas. Innovative Construction Materials and Techniques, Traditional Construction Techniques in Coastal Areas

UNIT–4 **(9)**

Seismology and Earthquake Effects– Causes of Earthquakes, Plate Tectonics, Faults, Seismic Waves; Magnitude, Intensity, Epicenter, Energy Release, and Ground Motions. Earthquake Effects– On Ground, Soil Rupture, Liquefaction, Landslides. Performance of Ground and Buildings in Past Earthquakes– Behavior of Various Types of Buildings and Structures, Collapse Patterns; Behavior of Non-Structural Elements Such as Services, Fixtures, and Mountings – Case Studies. Seismic Retrofitting– Weaknesses Existing Buildings, Aging, Concepts in Repair, Restoration, and Seismic Strengthening

UNIT–5 **(9)**

Planning and Design Considerations for Seismic Safety– General Planning and Design

Considerations; Building forms, Horizontal and Vertical Eccentricities, Mass and Stiffness Distribution, Soft Story Effects, Etc.; Seismic Effects Related to Building Configuration. Plan and Vertical Irregularities, Redundancy, and Setbacks. Construction Details– Various Types of Foundations, Soil Stabilization, Retaining Walls, Plinth Fill, Flooring, Walls, Openings, Roofs, Terraces, Parapets, Boundary Walls, Underground and Overhead Tanks, Staircases, and Isolation of Structures. Innovative Construction Materials and Techniques. Local Practices– Traditional Regional Responses. Computational Investigation Techniques.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	**Understand** the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies.	**PO1,PO6,PO8,PO9**
CO2	**Analyze** the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction.	**PO2,PO5,PO12**
CO3	**Apply** wind engineering principles and computational techniques in designing wind resistant structures.	**PO1, PO4,PO7, PO10**
CO4	**Evaluate** earthquake effects on buildings and develop strategies for seismic retrofitting.	**PO3,PO5,PO8**
CO5	**Assess** seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures.	**PO4,PO6,PO7,PO8 , PO9**

TEXT BOOKS:

1. David Alexander, Natural Disasters, 1st Edition, CRC Press, 2017.
2. Edward A. Keller and Duane E. De Vecchio, Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes, 5th Edition, Routledge, 2019.

REFRENCE BOOKS:

1. Ben Wisner, J.C. Gaillard, and Ilan Kelman (Editors), Handbook of Hazards and Disaster Risk Reduction and Management, 2nd Edition, Routledge, 2012.
2. Damon P. Coppola, Introduction to International Disaster Management, 4th Edition, Butterworth-Heinemann, 2020.
3. Bimal Kanti Paul, Environmental Hazards and Disasters: Contexts, Perspectives and Management, 2nd Edition, Wiley-Blackwell, 2020.

REFRENCE WEBSITE:

1. https://nptel.ac.in/courses/124107010
2. https://onlinecourses.swayam2.ac.in/cec19_hs20/preview

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	2	-	2	2	-	-	-
CO2	-	3	-	-	2	-	-	-	-	-	-	2
CO3	3	-	-	3	-	-	3	-	-	2	-	-
CO4	-	-	3	-	3	-	-	2	-	-	-	-
CO5	-	-	-	3	-	3	3	2	2	-	-	-
CO*	**3**	**3**	**3**	**3**	**2.5**	**2.5**	**3**	**2**	**2**	**2**		**2**

III B. Tech– VI Semester

230CE361B SUSTAINABILITY IN ENGINEERING PRACTICES (OPEN ELECTIVE – II)

L	T	P	C
3	0	0	3

COURSE EDUCATIONAL OBJECTIVES

The objectives of this course are to make the student:

1. To understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.
2. To analyze sustainable construction materials, their durability, and life cycle assessment.
3. To apply energy calculations in construction materials and assess their embodied energy.
4. To evaluate green building standards, energy codes, and performance ratings.
5. To assess the environmental effects of energy use, climate change, and global warming.

UNIT–1 INTRODUCTION (9)

Introduction and Definition of Sustainability - Carbon Cycle - Role of Construction Material: Concrete and Steel, Etc. - CO2Contribution from Cement and Other Construction Materials.

UNIT–2 MATERIALS USED in SUSTAINABLE CONSTRUCTION (9)

Construction Materials and Indoor Air Quality - No/Low Cement Concrete - Recycled and Manufactured Aggregate - Role of QC and Durability - Life Cycle and Sustainability.

UNIT–3 ENERGY CALCULATIONS (9)

Components of Embodied Energy - Calculation of Embodied Energy for Construction Materials - Energy Concept and Primary Energy - Embodied Energy Via-A-Vis Operational Energy in Conditioned Building - Life Cycle Energy Use

UNIT–4 GREEN BUILDINGS (9)

Control of Energy Use in Building - ECBC Code, Codes in Neighboring Tropical Countries - OTTV Concepts and Calculations – Features of LEED and TERI – GRIHA Ratings – Role of Insulation and Thermal Properties of Construction Materials - Influence of Moisture Content and Modeling - Performance Ratings of Green Buildings - Zero Energy Building

UNIT–5 ENVIRONMENTAL EFFECTS (9)

Non-Renewable Sources of Energy and Environmental Impact– Energy Norm, Coal, Oil, Natural Gas - Nuclear Energy - Global Temperature, Green House Effects, Global Warming - Acid Rain: Causes, Effects and Control Methods - Regional Impacts of Temperature Change.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	**Understand** the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials.	**PO1,PO6, PO7, PO8**
CO2	**Analyze** sustainable construction materials, their durability, and life cycle assessment.	**PO2,PO5, PO7,PO12**
CO3	**Apply** energy calculations in construction materials and assess their embodied energy.	**PO3,PO4, PO5, PO7,PO10**
CO4	**Evaluate** green building standards, energy codes, and performance ratings.	**PO3, PO4, PO5, PO7,PO8**
CO5	**Assess** the environmental effects of energy use, climate change, and global warming	**PO6,PO7,PO8**

TEXT BOOKS:

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition, Wiley Publishers 2016.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell, UK, 2016.

REFRENCE BOOKS:

1. Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.
2. William P Spence, Construction Materials, Methods & Techniques (3e), Yes Dee Publication Pvt. Ltd, 2012.

REFRENCE BOOKS:

1. https://archive.nptel.ac.in/courses/105/105/105105157/

CO-PO MAPPING:

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

III B. Tech– VI Semester

230CE361A	DIGITAL ELECTRONICS (OPEN ELECTIVE – II)	L T P C
		3 0 0 3

PRE-REQUISITES: Basic Mathematics

COURSE EDUCATIONAL OBJECTIVES:

1. To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
2. To analyze combinational circuits like adders, subtractors, and code converters.
3. To explore combinational logic circuits and their applications in digital design.
4. To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
5. To gain knowledge about programmable logic devices and digital IC's.

UNIT–:1 INTRODUCTION (9)

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT-2: INTRODUCTION TO COMBINATIONAL DESIGN 1 (9)

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT-3: COMBINATIONAL LOGIC DESIGN 2 (9)

Combinational Logic Design 2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT-4: SEQUENTIAL LOGIC DESIGN (9)

Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT-5: PROGRAMMABLE LOGIC DEVICES AND DIGITAL ICs (9)

Programmable Logic Devices:ROM, Programmable Logic Devices (PLA and PAL).

Digital IC's: Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Learn Boolean algebra, logic simplification techniques, and combinational circuit design.	**PO1, PO2**
CO2	Analyze combinational circuits like adders, subtractors, and code converters.	**PO1, PO2, PO3**
CO3	Explore combinational logic circuits and their applications in digital design.	**PO1, PO2, PO3**
CO4	Understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.	**PO1, PO2, PO3**
CO5	Gain knowledge about programmable logic devices and digital IC's.	**PO1, PO2**

TEXT BOOKS:

1. Digital Design, M.Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999.
2. Switching theory and Finite Automata Theory, ZviKohavi and NirahK.Jha, 2nd Edition, Tata McGraw Hill, 2005.

REFERENCE BOOKS:

1. Fundamentals of Logic Design, Charles H Roth,Jr., 5th Edition, Brooks/cole Cengage Learning, 2004.

REFERENCEWEBSITE:

1. https://archive.nptel.ac.in/courses/108/105/108105132/
2. https://archive.nptel.ac.in/courses/108/105/108105113/
3. https://archive.nptel.ac.in/content/storage2/courses/106108099/Digital%20Syste ms.pdf

CO-PO MAPPING:

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

III B.Tech. - VI Semester

230CS361A	**PRINCIPLES OF OPERATING SYSTEM (OPEN ELECTIVE – II)**	**L T P C** **3 0 0 3**

PRE-REQUISITES: A course on Introduction to Programming

COURSE EDUCATIONAL OBJECTIVES:

1. Understand the basic concepts ard principles of operating systems, including process management, memory management, file systems, and Protection.
2. Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
3. Illustrate different conditions for deadlock and their possible solutions.
4. Analyze the different Memory-Management Strategies.
5. Apply protection techniques like authentication, authorization, and file permissions in computer systems.

UNIT-1: OPERATING SYSTEMS OVERVIEW & SYSTEM STRUCTUR (9)

Operating Systems Overview: Introduction, operating system functions, operating systems operations, Computing environments, Free and Open-Source Operating Systems.

System Structures: Operating System Services, User and Operating-System Interface, system calls, Types of System Calls, system programs, operating system Design and Implementation, operating system structure, Building and Booting an Operating System, Operating system debugging.

UNIT -2: PROCESSES, THREADS AND CONCURRENCY & CPU SCHEDULING (9)

Processes: Process Concept, Process scheduling, Operations on processes, Inter – process communication. Threads and Concurrency: Multithreading models, Thread libraries, Threading issues. CPU Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling.

UNIT 3: SYNCHRONIZATION TOOLS & DEADLOCKS (9)

Synchronization Tools: The Critical Section Problem, Peterson's Solution, Mutex Locks, Semaphores, Monitors, Classic problems of Synchronization.

Deadlocks: system Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from Deadlock.

UNIT 4: MEMORY-MANAGEMENT STRATEGIES & STORAGE MANAGEMENT (9)

Memory-Management Strategies: Introduction, Contiguous memory allocation, Paging, Structure of the Page Table, Swapping.

Virtual Memory Management: Introduction, Demand paging, Copy-on- write, Page replacement, Allocation of frames, Thrashing.

Storage Management: Overview of Mass Storage Structure, HDD Scheduling.

UNIT 5: FILE SYSTEM & PROTECTION (9)

File System: File System Interface, File concept, Access methods, Directory Structure, File system Implementation, File-system structure, File-system Operations, Directory implementation, Allocation method, Free space management, File-System Internals: File System Mounting, Partitions and Mounting, File Sharing.

Protection: Goals of protection, Principles of protection, Protection Rings, Domain of protection, Access matrix.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course the student will be		POs
C01	Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.	**PO1, PO2**
CO2	Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection,	**P01,P03,P04**
CO3	Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system	**P01, P02, PO3,PO4,PO5**
C04	Illustrate different conditions for deadlock and their possible solutions. (L2)	**PO1, PO2, PO4**
cos	Analyze the memory management and it's a! location policies. (L4)	**PO1,PO4**

TEXT BOOKS:

1. Operating System Concepts, Silberschatz A, Galvin P B, Gagne G, 10th Edition, Wiley, 2018.
2. Modern Operating Systems, Tanenbaum AS, 4th Edition, Pearson, 2016

REFERENCE BOOKS:

1. Operating Systems -Internals and Design Principles, Stallings W, 9th edition, Pearson, 2018
2. Operating Systems: A Concept Based Approach, D.M Dhamdhere, 3rd Edition, McGraw- Hill, 2013

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/106/106/106106144/
2. http://peterindia.net/OperatingSystems.html

CO-PO MAPPING:

Co/ PO	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	2	-	3	3	-	-	-	-	-	-	-	-
CO3	2	2	3	2	3	-	-	-	-	-	-	-
C04	2	2	-	3	-	-	-	-	-	-	-	-
CO5	3	-	-	2	-	-	-	-	-	-	-	-
CO*	2.4	2	3	2.5	3							

III B.Tech. - VI Semester

23OML361A	INTRODUCTION TO MACHINE LEARNING (Open Elective-II)	L	T	P	C
		3	0	0	3

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. Understand the fundamental concepts of machine learning, its types, applications, and data preprocessing techniques.
2. Learn to select, train, evaluate, and improve machine learning models while applying feature engineering techniques.
3. Explore Bayesian methods for concept learning and understand various classification algorithms.
4. Understand regression techniques for predictive modeling and methods to enhance model accuracy.
5. Learn unsupervised learning techniques such as clustering and association rule mining for pattern discovery.

UNIT 1:INTRODUCTION TO MACHINE LEARNING & PREPARING TO MODEL(9)

Introduction: What is Human Learning? Types of Human Learning, what is Machine Learning? Types of Machine Learning, Problems Not to Be Solved Using Machine Learning, Applications of Machine Learning, State-of-The-Art Languages/Tools in Machine Learning, Issues in Machine Learning

Preparing to Model: Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing.

UNIT 2: MODELING AND EVALUATION &BASICS OF FEATURE ENGINEERING (9)

Introduction, selecting a Model, training a Model (for Supervised Learning), Model Representation and Interpretability, Evaluating Performance of a Model, Improving Performance of a Model Basics of Feature Engineering: Introduction, Feature Transformation, Feature Subset Selection.

UNIT 3: BAYESIAN CONCEPT LEARNING & SUPERVISED LEARNING: CLASSIFICATION (9)

Introduction, Why Bayesian Methods are Important? Bayes' Theorem, Bayes' Theorem and Concept Learning, Bayesian Belief Network.

Supervised Learning: Classification: Introduction, Example of Supervised Learning, Classification Model, Classification Learning Steps, Common Classification Algorithms-k-Nearest Neighbour (kNN), Decision tree, Random forest model, Support vector machines.

UNIT 4: SUPERVISED LEARNING: REGRESSION (9)

Introduction, Example of Regression, Common Regression Algorithms-Simple linear regression, Multiple linear regression, Assumptions in Regression Analysis, Main Problems in Regression Analysis, Improving Accuracy of the Linear Regression Model, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.

UNIT 5: UNSUPERVISED LEARNING (9)

Introduction, Unsupervised vs Supervised Learning, Application of Unsupervised Learning, Clustering – Clustering as a machine learning task, Different types of clustering techniques, Partitioning methods, K-Medoids: a representative object-based technique, Hierarchical clustering, Density-based methods-DBSCAN Finding Pattern using Association Rule- Definition of common terms, Association rule, Theapriori algorithm for association rule learning, Build the a priori principle rules.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Explain the significance of machine learning types, applications, and data quality in model building	**PO1,PO2,PO3,PO4**
CO2	Apply feature engineering methods to improve model performance and interpretability. Implement classification models such as k-NN, Decision Trees, and Random Forest for predictive tasks	**PO1,PO2,PO3,PO4**
CO3	Implement classification algorithms such as k-NN, Decision Trees, and Random Forests.	**PO1,PO2,PO3,PO4**
CO4	Analyze regression algorithms and improve model accuracy using optimization techniques.	**PO1,PO2,PO3,PO4**
CO5	Design clustering models using partitioning and density-based techniques for pattern recognition.	**PO1,PO2,PO3,PO4**

TEXT BOOKS:

1. Saikat Dutt, Subramanian Chandra mouli, Amit Kumar Das, Machine Learning, Pearson, 2019.

REFERENCE BOOKS:

1. Ethern Alpaydin, — Introduction to Machine Learning‖, MIT Press, 2004.
2. Stephen Marsland, — Machine Learning - An Algorithmic Perspective, Second Edition, Chapman and Hall / CRC Machine Learning and Pattern Recognition Series, 2014.
3. Andreas C. Müller and Sarah Guido —Introduction to Machine Learning with Python: A Guide for Data Scientists‖, Oreilly, 2016.

REFERENCE WEBSITE:

1. Andrew Ng, - Machine Learning ‖ https://www.coursera.org/instructor/andrewng
2. Shai Shalev-Shwartz , Shai Ben-David, —Understanding Machine Learning: From Theory to Algorithms‖ , Cambridge University Press, 2014.
3. https://www.deeplearning.ai/courses/machine-learning-specialization/
4. https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/index.html

CO-PO MAPPING:

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

III B.Tech. - VI Semester

23OME361A	**PRINCIPLES OF AUTOMATION AND ROBOTICS (OPEN ELECTIVE-II)**	**L T P C** **3 0 0 3**

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. Fundamentals of industrial automation, production types, automation strategies, and hardware elements used in modern manufacturing processes.
2. Understanding of automated manufacturing systems, and strategies for improving productivity and flexibility in industrial automation.
3. Knowledge of industrial automation and robotics, sensors, and end-effector design for modern manufacturing environments.
4. Explain industrial automation and robotics, and trajectory planning for intelligent and efficient manufacturing applications.
5. Familiarity of industrial automation and robotics, and practical applications in manufacturing processes.

UNIT –1: INTRODUCTION TO AUTOMATION: (9)

Introduction to Automation, Need, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing in manufacturing, Automation strategies and levels of automation, Hardware components for automation and process control, mechanical feeders, hoppers, orienteers, high speed automatic insertion devices.

UNIT –2: AUTOMATED FLOW LINES: (9)

Automated flow lines, Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines. Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines**.**

UNIT –3: INTRODUCTION TO INDUSTRIAL ROBOTICS: (9)

Introduction to Industrial Robotics, Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers. Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors.

UNIT –4: MANIPULATOR KINEMATICS: (9)

Manipulator Kinematics: Manipulator Kinematics, Homogenous transformations as applicable to rotation and transition - D-H notation, Forward inverse kinematics. Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton – Euler formations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion.

UNIT –5: ROBOT PROGRAMMING AND APPLICATIONS: (9)

Robot Programming: Lead through programming – Robot language structure – Motion commands of move, speed control, workplace, path, frames, end effecter operation, sensor operation and react statement – Program sequence and subroutine – Teach pendant programming – VAL II programming. Robot Applications: Material transfer and machine loading / unloading – Processing applications in spray coating, spot and arc welding – Assembly and inspection automation – Selection of robots in industry applications

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand and analyze the structure and functions of automated manufacturing systems, and evaluate hardware components for efficient production.	**PO1,PO2,PO3,PO4**
CO2	Analyze and design automated flow lines with or without buffer storage, perform quantitative evaluations, apply assembly line balancing techniques.	**PO1,PO2,PO3,PO4**
CO3	Classify robot configurations, select suitable actuators and sensors, analyze and apply automation and robotics principles to optimize production efficiency and flexibility	**PO1,PO2,PO3,PO4**
CO4	Apply kinematic and dynamic modeling using D-H notation and select appropriate hardware and control strategies for real-world industrial scenario to analyze and design automated and robotic systems.	**PO1,PO2,PO3,PO4**
CO5	Design, program, and implement robotic systems, understand and apply robotics technology to manufacturing tasks.	**PO1,PO2,PO3,PO4**

TEXT BOOKS:

1. Automation, Production systems and CIM,M.P. Groover /Pearson Edu.
2. Industrial Robotics - M.P. Groover, TMH.

REFERENCE BOOKS:

1. Robotics, Fu K S, McGraw Hill, 4th edition, 2010.
2. An Introduction to Robot Technology, P. Coiffet and M. Chaironze, Kogam Page Ltd. 1983, London.
3. Robotic Engineering, Richard D. Klafter, Prentice Hall
4. Robotics, Fundamental Concepts and analysis – Ashitave Ghosal, Oxford Press, 1/e, 2006
5. Robotics and Control, Mittal R K &Nagrath IJ , TMH

REFERENCE WEBSITE:

1. https://www.youtube.com/watch?v=yxZm9WQJUA0&list=PLRLB5WCqU54UJG45UnazSYmnmhl-gt76o
2. https://www.youtube.com/watch?v=6f3bvIhSWyM&list=PLRLB5WCqU54X5Vy4DwjfSODT3ZJgwEjyE

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	2	2	-	-	-	-	-	-	-	-
CO.2	3	2	2	2	-	-	-	-	-	-	-	-
CO.3	3	2	2	2	-	-	-	-	-	-	-	-
CO.4	3	2	2	2	-	-	-	-	-	-	-	-
CO.5	3	2	2	2	-	-	-	-	-	-	-	-
CO*	3	2	2	2	-	-	-	-	-	-	-	-

III B Tech- VI Semester

23OSH361A	**OPTIMIZATION TECHNIQUES FOR ENGINEERS**	**L T P C**
	(OPEN ELECTIVE-II)	**3 0 0 3**

COURSE EDUCATIONAL OBJECTIVES:

1. Impart knowledge on theory of optimization and conditions for optimality for unconstraint and constraint optimization problems
2. Inculcate modeling skills necessary to describe and formulate optimization problems in design and manufacturing
3. Familiarize with the working principle of optimization algorithms used to solve linear and non-linear problems
4. Train the students to solve optimization problems using software tools.
5. Analyze the different geometric programming problem, primal-dual programming.

UNIT–1: LINEAR PROGRAMMING I (9)

Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Geometry of Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two phase Simplex Method, Big-M method.

UNIT–2: LINEAR PROGRAMMING II: DUALITY IN LINEAR PROGRAMMING (9)

Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem, Complementary slackness Theorem

UNIT–3: NON – LINEAR PROGRAMMING: UNCONSTRAINED OPTIMIZATION TECHNIQUES (9)

Introduction: Classification of Unconstrained minimization methods, Direct Search Methods: Random Search Methods: Descent Method and Fletcher Powell Method, Grid Search Method

UNIT–4: NON-LINEAR PROGRAMMING: CONSTRAINED OPTIMIZATION TECHNIQUE (9)

Introduction, Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria.

UNIT-5: GEOMETRIC PROGRAMMING (9)

Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.
Constrained minimization Problems: Solution of a constrained geometric programming problem, primal-dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POS
CO1	Understand the meaning, purpose, tools of Operations Research and linear programming in Solving practical problems in industry.	**PO1,PO2,PO3,PO4, PO12**
CO2	Interpret the transportation models' solutions and infer solutions to the real-world problems.	**PO1,PO2,PO3,PO4, PO12**
CO3	Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications.	**PO1,PO2,PO3,PO4, PO12**
CO4	Apply the concept to non-linear programming for solving the problems involving non-linear constraints and objectives	**PO1,PO2,PO3,PO4, PO12**
CO5	Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives.	**PO1,PO2,PO3,PO4, PO12**

TEXTBOOKS:

1. Singiresu S Rao. Engineering Optimization: Theory and Practices, New Age Int.(P)Ltd. Publishers, New Delhi.
2. J.C.Panth, Introduction to Optimization Techniques,(7-e)Jain Brothers, New Delhi.

REFERENCE BOOKS:

1. Harvey M.Wagner, Principles of Operation Research, Printice-Hall of India Pvt. Ltd. New Delhi.
2. Peressimi A.L., Sullivan F.E., Vhl, J. J. Mathematics of Non-linear Programming, Springer –Verlag.

REFERENCE WEBSITE:

1. https://onlinecourses.nptel.ac.in/noc24_ee122/preview
2. https://archive.nptel.ac.in/courses/111/105/111105039/
3. https://onlinecourses.nptel.ac.in/noc21_ce60/preview

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	-	-	-	1
CO2	3	2	2	2	-	-	-	-	-	-	-	1
CO3	3	2	2	1	-	-	-	-	-	-	-	1
CO4	2	2	2	1	-	-	-	-	-	-	-	1
CO5	3	3	2	1	-	-	-	-	-	-	-	1
CO*	**2.8**	**2.4**	**2**	**1.4**								

III B Tech- VI Semester

23OSH361B	MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES (OPEN ELECTIVE-II)	L T P C 3 0 0 3

COURSE EDUCATIONAL OBJECTIVES:

1. To provide students with essential linear algebra foundations including vector spaces, inner products, and operators for quantum mechanical applications.
2. To develop understanding of the transition from finite-dimensional systems to infinite-dimensional function spaces and Hilbert space concepts.
3. To establish quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution principles.
4. To enable students to apply quantum mechanical principles to solve problems in simple quantum systems and understand statistical interpretation.
5. To introduce advanced concepts in composite systems, measurement processes, and modern perspectives in quantum mechanics.

UNIT 1: Linear Algebra Foundation for Quantum Mechanics (9)

Vector spaces definition and examples (R^2, R^3, function spaces), Inner products (dot product, orthogonality, normalization), Linear operators (matrices, eigenvalues, eigenvectors), Finite-dimensional examples (2×2 matrices, spin-1/2 systems), Dirac notation introduction ($|\psi\rangle$, $\langle\varphi|$, $\langle\varphi|\psi\rangle$), Change of basis (transformations, unitary matrices).

UNIT 2: From Finite to Infinite Dimensions (9)

Function spaces (L^2 space, square-integrable functions), Inner products for functions ($\int\psi^*\varphi\, dx$), Orthogonal function sets (Fourier series, basis functions), Introduction to Hilbert space concept (complete inner product spaces), Position and momentum representations (wave functions), Operators on functions (d/dx, multiplication by x).

UNIT 3: Quantum Mechanical Formalism (9)

Mathematical formulation (states as vectors, observables as operators), Measurement theory (Born rule, expectation values, probabilities), Uncertainty relations (mathematical derivation from commutators), Time evolution (Schrödinger equation, unitary evolution).

UNIT 4: Applications and Statistical Interpretation (9)

Simple applications (infinite square well, harmonic oscillator), Statistical interpretation (ensembles, pure vs mixed states), Measurement process (von Neumann measurement scheme).

UNIT 5: Advanced Topics (9)

Composite systems (tensor products basic introduction), Reversibility and irreversibility (unitary evolution vs measurement), Thermodynamic connections (equilibrium states, entropy), Modern perspectives (decoherence, measurement problem conceptual).

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POS
CO1	Understand vector spaces, inner products, and linear operators with applications to quantum systems.	**PO1,PO2,PO3,PO4,PO5,PO12**
CO2	Apply linear algebra concepts to function spaces and analyze the transition from finite to infinite dimensional systems.	**PO1,PO2,PO3,PO4,PO5,PO12**
CO3	Analyze quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution.	**PO1,PO2,PO3,PO4,PO5,PO12**
CO4	Apply quantum mechanical principles to solve problems in simple quantum systems and evaluate statistical interpretations.	**PO1,PO2,PO3,PO4,PO5,PO12**
CO5	Evaluate advanced concepts in composite systems and synthesize understanding of measurement processes and modern quantum theory.	**PO1,PO2,PO3,PO4,PO5,PO6,PO12**

TEXT BOOKS:

1. David J. Griffiths, Darrell F. Schroeter, "Introduction to Quantum Mechanics", 3rd Edition, Cambridge University Press (2018).
2. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Kluwer Academy/Plenum Publishers (1994).

REFERENCE BOOKS:

1. George. F. Simmons, "Introduction to Topology and Modern Analysis", Med Tech Science Press.
2. Gilbert Strang, Linear Algebra and Its Applications, 4th Edition, Cengage Learning (2006).
3. John von Neumann and Robert T Beyer, Mathematical Foundations of Quantum Mechanics, Princeton Univ. Press (1996).

REFERENCE WEBSITE:

1. https://eclass.uoa.gr/modules/document/file.php/CHEM248/Griffiths%20-%20Introduction%20to%20Quantum%20Mechanics%203rd%20ed%202018.pdf
2. https://fisica.net/mecanica-quantica/Shankar%20-%20Principles%20of%20quantum%20mechanics.pdf

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	-	-	-	-	-	-	2
CO2	3	3	3	2	2	-	-	-	-	-	-	2
CO3	3	3	3	2	2	-	-	-	-	-	-	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2
CO5	3	3	3	3	2	1	-	-	-	-	-	3
CO*	3	3	3	2	2	1						2.2

III B.Tech. - VI Semester

23OSH361C **PHYSICS OF ELECTRONIC MATERIALS AND DEVICES (Open Elective-II)**

L	T	P	C
3	0	0	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To facilitate a deeper understanding of crystal growth, defects in crystals, and thin-films.
2. To examine and understand the properties, characteristics, and applications of various semiconducting materials, and their role in advancing technology.
3. To establish a solid foundation in the principles and practices of semiconductor physics and devices engineering.
4. To examine the fundamental principles governing excitonic and luminescent processes in solid-state materials, and their significance in optoelectronic applications.
5. To gain insight into the principles, innovations, and applications of modern display systems.

UNIT-1: FUNDAMENTALS OF MATERIALS SCIENCE (9)

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. The basic idea of point, line, and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge).

UNIT 2: SEMICONDUCTORS (9)

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum-well, Change of electron-hole concentration-Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

UNIT 3: PHYSICS OF SEMICONDUCTOR DEVICES (9)

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Hetero junctions, Transistors, MOSFETs.

UNIT 4: EXCITONS AND LUMINESCENCE: (9)

Luminescence: Different types of luminescence, basic definitions, Light emission in solids, Inter-band luminescence, Direct and indirect gap materials. Photoluminescence: General Principles of photoluminescence, Excitation and relaxation, OLED, Quantum-dot. Electro-luminescence: General Principles of electroluminescence, light emitting diode, diode laser.

UNIT 5: DISPLAY DEVICES: (9)

LCD, three-dimensional display: Holographic display, light-field displays: Head-mounted display, MOEMS (Micro-Opto-Electro-Mechanical Systems) and MEMS displays.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand the principles of crystal growth and techniques for thin film fabrication	**PO1, PO2,PO3,PO4,PO5**
CO2	Summarize fundamental concepts of semiconductors and their classification	**PO1, PO2,PO3,PO4,PO5**
CO3	Illustrate the operating principles of various semiconductor devices	**PO1, PO2,PO3,PO4,PO5**
CO4	Analyze different luminescent phenomena and the functioning of devices based on these mechanisms	**PO1, PO2,PO3,PO4**
CO5	Explain the construction and working principles of various types of display devices	**PO1, PO2,PO3,PO4**

TEXT BOOKS:

1. Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd., 4th edition, 2021.
2. Semiconductor physics & devices: basic principles, 4th Edition, McGraw-Hill, 2012.

REFERENCE BOOKS:

1. Solid State Electronic Devices-B.G.Streetman and S.Banerjee, PHI Learning, 6th edn.
2. An Introduction to Electronic Materials for Engineers-Wei Gao, ZhengweiLi, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd. 2nd Edition, 2011.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/113/106/113106062/
2. https://onlinecourses.nptel.ac.in/noc20_ph24/preview

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-
CO3	3	3	2	1	1	-	-	-	-	-	-	-
CO4	3	2	1	1	-	-	-	-	-	-	-	-
CO5	3	3	1	1	-	-	-	-	-	-	-	-
CO*	3	2.8	1.6	1.2	1							

III B Tech- II Semester

		L	T	P	C
23OSH361D	**CHEMISTRY OF POLYMERS AND APPLICATIONS OPEN ELECTIVE-II**	**3**	**-**	**-**	**3**

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the basic principles of polymers
2. To understand natural polymers and their applications.
3. To impart knowledge to the students about synthetic polymers, their preparation and importance.
4. To enumerate the applications of hydrogel polymers
5. To enumerate applications of conducting and degradable polymers in engineering

Unit – 1: POLYMERS-BASICS AND CHARACTERIZATION: (9)

Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: addition, condensation, copolymerization and coordination polymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, poly dispersity and molecular weight distribution. Measurement of molecular weight: End group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

Unit – 2: NATURAL POLYMERS & MODIFIED CELLULOSIC (9)

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins.

Modified cellulosic: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

Unit – 3: SYNTHETIC POLYMERS (9)

Addition and condensation polymerization processes– Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties. Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers (PE, PVC), Butadiene polymers (BUNA-S, BUNA-N), nylons, Urea-formaldehyde, phenol – formaldehyde, Melamine Epoxy and Ion exchange resins.

Unit-4: HYDROGELS OF POLYMER NETWORKS (9)

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.

Unit – 5: CONDUCTING AND DEGRADABLE POLYMERS: (9)

Conducting polymers: Introduction, Classification, Mechanism of conduction in Poly Acetylene, Poly Aniline, Poly Thiophene, Doping, Applications.

Degradable polymers: Introduction, Classifications, Examples, Mechanism of degradation, poly lactic acid, Nylon-6, Polyesters, applications.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Classify the polymers, explain polymerization mechanism, differentiate addition, condensation polymerizations, Describe measurement of molecular weight of polymer	**PO1, PO2, PO4, PO5**
CO2	Describe the physical and chemical properties of natural polymers and modified cellulosic.	**PO1, PO2, PO4, PO6**
CO3	Differentiate Bulk, solution, Suspension and emulsion polymerization, describe fibers and elastomers, Identify the thermosetting and thermos polymers.	**PO1, PO2, PO4, PO5,PO12**
CO4	Identify types of polymer networks, describe methods involve in hydrogel preparation, Explain applications of hydrogels in drug delivery.	**PO1, PO2, PO4,PO5**
CO5	Explain classification and mechanism of conducting and degradable polymers.	**PO1, PO2, PO4, PO5**

TEXT BOOKS:

1. A Text book of Polymer science, Billmayer
2. Polymer Chemistry – G.S. Mishra
3. Polymer Chemistry – Gowarikar

REFERENCE BOOKS:

1. Organic polymer Chemistry, K.J. Saunders, Chapman and Hall
2. Advanced Organic Chemistry, B. Miller, Prentice Hall
3. Polymer Science and Technology by Premamoy Ghosh, 3rd edition, McGraw-Hill, 2010.

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	1	2	-	-	-	-	-	-	-
CO2	3	3	2	2	-	2	-	-	-	-	-	-
CO3	2	2	3	2	1	-	-	-	-	-	-	2
CO4	2	3	2	2	3	-	-	-	-	-	-	-
CO5	2	3	2	3	2	-	-	-	-	-	-	-
CO*	**2.2**	**2.8**	**2.4**	**2**	**1.4**	**2**						**2**

III B Tech- VI Semester

23OSH361E	ACADEMIC WRITING AND PUBLIC SPEAKING (OPEN ELECTIVE – II)	L	T	P	C
		3	0	0	3

COURSE EDUCATIONAL OBJECTIVES:

1. To encourage all round development of the students by focusing on writing skills
2. To make the students aware of non-verbal skills
3. To develop analytical skills
4. To deliver effective public speeches
5. Apply verbal communication techniques such as voice modulation, clarity, pronunciation, and fluency.

UNIT-1: Introduction to Academic Writing (9)

Introduction to Academic Writing –Essential Features of Academic Writing –Courtesy–Clarity–Conciseness–Correctness–Coherence–Completeness–Types–Descriptive, Analytical,

Persuasive, Critical writing

UNIT-2: Academic Journal Article (9)

Art of condensation-summarizing and paraphrasing-Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing – Conference Paper writing - Editing, Proof Reading – Plagiarism

UNIT-3: Essay &Writing Reviews (9)

Compare and Contrast –Argumentative Essay– Exploratory Essay–Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review- So P.

UNIT-4: Public Speaking (9)

Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4Ps of Presentation–Stage Dynamics–Answering Strategies Analysis of Impactful Speeches-Speeches for Academic events

UNIT-5: Public Speaking and Non-Verbal Delivery (9)

BodyLanguage–Facial Expressions–Kinesics–Oculesics–Proxemics–Haptics–Chronomics-ara language-Signs.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand various elements of Academic Writing	**PO1.PO2,PO3,PO4, PO5,PO12**
CO2	Apply summarizing, paraphrasing, and abstract writing techniques.	**PO1.PO2,PO3,PO4, PO5,PO12**
CO3	Develop effective Statement of Purpose writing skills.	**PO1.PO2,PO3,PO4, PO5,PO6,PO12**
CO4	Understand the nature, characteristics, and significance of public speaking.	**PO1.PO2,PO3,PO4, PO5,PO12**
CO5	Understand the role of body language in communication.	**PO1.PO2,PO3,PO4, PO5,PO12**

TEXT BOOKS:

1. Critical Thinking, Academic Writing and Presentation Skills: MG University Edition Pearson Education; First edition 2010.
2. Pease, Allan & Barbara. The Definitive Book of Body Language RHUS Publishers, 2016.

REFERENCE BOOKS:

1. Alice Savage, Masoud Shafiei Effective Academic Writing, 2Ed.,2014.
2. Shalini Verma, Body Language, S Chand Publications 2011.
3. Sanjay Kumarand Pushpa lata, CommunicationSkills2E 2015, Oxford.
4. Sharon Gerson, Steven Gerson, Technical Communication Process and Product, Pearson, New Delhi, 2014
5. Elbow, Peter. Writing with Power.OUPUSA,1998.

REFERENCE WEBSITE:

1. https://youtu.be/NNhTIT81nH8
2. https://www.youtube.com/watch?v=478ccrWKY-A
3. https://www.youtube.com/watch?v=nzGo5ZC1gMw
4. https://www.youtube.com/watch?v=Qve0ZBmJMh4
5. https://courses.lumenlearning.com/publicspeakingprinciples/chapter/cha pter-12-nonverbal-aspects-of-delivery/
6. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	1
CO2	3	3	2	3	2	-	-	-	-	-	-	2
CO3	3	3	3	3	2	1	-	-	-	-	-	2
CO4	3	3	2	2	1	-	-	-	-	-	-	1
CO5	3	3	3	3	2	-	-	-	-	-	-	2
CO*	**3**	**3**	**2.4**	**2.6**	**1.6**	**1**						**1.6**

III B TECH. - VI SEMESTER

23ECE358L	**MICROPROCESSORS AND MICROCONTROLLERS LAB (PROFESSIONAL CORE)**	**L T P C** **0 0 3 1.5**

COURSE OBJECTIVES:

1. To become skilled in 8086 Assembly Language programming.
2. To understand the detailed software and hardware structure of the microprocessor.
3. Train their practical knowledge through laboratory experiments.
4. To understand and learn 8051 Microcontroller.
5. To acquire knowledge on microprocessors and microcontrollers, interfacing various peripherals, and configuring.

LIST OF EXPERIMENTS:

(ANY TEN OF THE EXPERIMENTS ARE TO BE CONDUCTED)

1. Programs for 16 Bit Arithmetic Operations (Using various addressing modes)
   a) Write an ALP to Perform Addition and Subtraction of Multi precision numbers.
   b) Write an ALP to Perform Multiplication and division of signed and unsigned Hexadecimal numbers.
   c) Write an ALP to find square, cube and factorial of a given number.
2. Programs Involving Bit Manipulation Instructions
   a) Write an ALP to find the given data is positive or negative.
   b) Write an ALP to find the given data is odd or even.
   c) Write an ALP to find Logical ones and zeros in a given data.
3. Programs on Arrays for 8086
   a) Write an ALP to find Addition/subtraction of N no_s.
   b) Write an ALP for finding largest/smallest no.
   c) Write an ALP to sort given array in Ascending/descending order.
4. Programs on String Manipulations for 8086
   a) Write an ALP to find String length.
   b) Write an ALP for Displaying the given String.
   c) Write an ALP for Comparing two Strings.
   d) Write an ALP to reverse String and Checking for palindrome.
5. Programs for Digital Clock Design Using 8086
   a) Write an ALP for Designing clock using INT 21H Interrupt.
   b) Write an ALP for Designing clock using DOS Interrupt Functions.
   c) Write an ALP for Designing clock by reading system time.
6. Interfacing Stepper Motor with 8086
   a) Write an ALP to 8086 processor to Interface a stepper motor and operate it in clockwise by choosing variable step-size.
   b) Write an ALP to 8086 processor to Interface a stepper motor and operate it in Anti-clockwise by choosing variable step-size.
7. Interfacing ADC/DAC with 8086
   a) Write an ALP to 8086 processor to Interface ADC.
   b) Write an ALP to 8086 processor to Interface DAC and generate Square Wave/Triangular Wave/Step signal.
8. Communication between Two Microprocessors

a) Write an ALP to have Parallel communication between two microprocessors using 8255

b) Write an ALP to have Serial communication between two microprocessor kits using 8251.

9. Programs using Arithmetic and Logical Instructions for 8051

   a) Write an ALP to 8051 Microcontroller to perform Arithmetic operations like addition, subtraction,

   b) Multiplication and Division.

   c) Write an ALP to 8051 Microcontroller to perform Logical operations like AND, OR and XOR. Programs related to Register Banks.

10. Programs to Verify Timers/Counters of 8051

    a) Write a program to create a delay of 25msec using Timer0 in mode 1 and blink all the Pins of P0.

    b) Write a program to create a delay of 50 µsec using Timer1 in mode 0 and blink all the Pins of P2.

    c) Write a program to create a delay of 75msec using counter0 in mode 2 and blink all the Pins of P1.

    d) Write a program to create a delay of 80 µsec using counter1 in mode 1 and blink all the Pins of P3.

11. UART Operation in 8051

    a) Write a program to transfer a character serially with a baud rate of 9600 using UART.

    b) Write a program to transfer a character serially with a baud rate of 4800 using UART.

    c) Write a program to transfer a character serially with a baud rate of 2400 using UART.

12. Interfacing LCD with 8051

    a) Develop and execute the program to interface16*2 LCD to 8051.

    b) Develop and execute the program to interface LCD to 8051 in 4-bit or 8-bit mode.

Total Hours:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Develop testing and experimental procedures on 8086 microprocessor and analyze the operation under different cases.	**PO1**
CO2	Setup programming strategies and select proper mnemonics and run the program on the training boards.	**PO2**
CO3	Able to understand and work with microprocessor real time interfaces including digital to analog converters, stepper motors, analog to digital converters	**P03**
CO4	Design and implement programs on 8051 and PIC microcontrollers	**PO4**
CO5	Able to interfacing circuits with RTOS development boards and understand the concept related to I/O devices.	**PO5**
CO6	Follow ethical principles in designing, simulating and implementing various circuits.	**PO8**

CO7	Do experiments effectively as an individual and as a member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understandings about the experiments.	**PO10**
CO9	Continue updating their skill related to semiconductors implementation for various application during their life time	**PO12**

REFERENCE BOOKS:

1. Kenneth.J.Ayala. The 8051 microcontroller, 3rd edition, Cengage learning,2010.
2. Advanced microprocessors and peripherals-A.K ray and K.M.Bhurchandani, TMH, 2nd edition2006. The 8051 Microcontroller and Embedded Systems: Using Assembly and C by Muhammad AliMazidi, Janice GillispieMazidi, Second Edition.

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	-
CO.2	-	3	-	-	-	-	-	-	-	-	-	-
CO.3	-	-	3	-	-	-	-	-	-	-	-	-
CO.4	-	-	-	3	-	-	-	-	-	-	-	-
CO.5	-	-	-	-	3	-	-	-	-	-	-	-
CO.6	-	-	-	-	-	-	-	3	-	-	-	-
CO.7	-	-	-	-	-	-	-	-	3	-	-	-
CO.8	-	-	-	-	-	-	-	-	-	3	-	-
CO.9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

III B TECH. - VI SEMESTER

23EEE366L	**ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB (Professional Core)**	**L**	**T**	**P**	**C**
		0	**0**	**0**	**1.5**

PRE-REQUISITES: Basic Electrical Engineering Lab

COURSE EDUCATIONAL OBJECTIVES:

1. Calibration of various electrical measuring instruments
2. Accurate determination of inductance and capacitance using AC Bridges
3. Measurement of resistance for different range of resistors using bridges
4. Performance of transducers and sensors

CHOOSE ANY TEN FROM THE FOLLOWING LIST:

1.Measurement of resistance using Wheatstone bridge and Kelvin�much Double Bridge.
2.Measurement of inductance using Maxwell‘s bridge, Anderson bridge.
3.Measurement of capacitance using De-Sauty's bridge, Schering bridge.
4.Calibration of single-phase energy meter using direct loading method.
5.Calibration of energy meter using Phantom load kit.
6.Measurement of Power using 3-Voltmeter and 3-Ammeter methods in a single-phase Circuit.
7.Measurement to Real and Reactive Power in a three-phase circuit.
8.Extension of range of given Ammeter and Voltmeter.
9.Measurement of displacement using LVDT.
10. 'To measure the voltage, current, power, and efficiency of the PV module at different sun angles or times of the day.
11. Measurement of different ranges of temperatures using i)RTD ii) Thermocouple
12. Measurement of strain with the help of strain gauge transducers.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Determine the unknown Resistance, Inductance and Capacitance using AC and DC bridges	**PO1**
CO2	Understand the calibration of single-phase energy meter	**PO2**
CO3	Understand the measurement of power, power factor in a single-phase circuit and real, reactive Power in a three-phase circuit	**PO3**
CO4	Understand the working of Transducers, Measure distance, temperature, current, voltage and humidity using sensors	**PO5**
CO5	Follow the ethical principles in while doing the exercises.	**PO8**
CO6	Do the exercises effectively as an individual and as a team member ina group	**PO9**
CO7	Communicate verbally among team members and in written form,the understanding about the trade exercises.	**PO10**
CO8	Continue updating their skill related to trades.	**PO12**

TEXT BOOKS:

1. Electrical & Electronic Measurement & Instruments by A.K. Sawhney Dhanpat Rai & Co. Publications, 2007.
2. Electrical Measurements and measuring Instruments–by E.W.Golding and F.C. Widdis, 5th Edition, Reem Publications, 2011.
3. Buckingham and Price, ―Electrical Measurements‖, Prentice – Hall

REFERENCE BOOKS:

1. Electronic Instrumentation by H.S.Kalsi,Tata Mcgrawhill, 3rd Edition, 2011.
2. Electrical Measurements: Fundamentals, Concepts, Applications–by Reissl and, M.U, New Age International (P) Limited, 2010.
3. Electrical & Electronic Measurement & Instrumentation by R.K.Rajput, 2nd Edition, S. Chand & Co., 2nd Edition, 2013.
4. Sensor Technology: Hand Book by JonS. Wilson, ELSEVIER publications,2005.

REFERNCE LINK: https://onlinecourses.nptel.ac.in/noc22_ee112/preview

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

III B TECH. - VI SEMESTER

23EEE365L	APPLICATIONS OF SOFT COMPUTING TOOLS IN ELECTRICAL ENGINEERING (Skill Enhancement course)	L	T	P	C
		0	1	2	2

COURSE OBJECTIVES:

1. Understand the basic concepts of Electrical Engineering.
2. Apply the concepts to design MATLAB models.
3. Analyse various Electrical engineering applications through MATLAB.
4. Develop real time models using MATLAB.

THEORY:

MATLAB-Introduction, different tool boxes, creation of program files, creation of Simulink files, GUI, commonly used blocks, Sim power system toolbox, control system toolbox, Sim Drive lines, Creation of functions, Project implementation through MATLAB

CHOOSE ANY TEN FROM THE FOLLOWING LIST:

1. Transient analysis of given electrical network
2. Simulation of 1-phase and 3-phase transformers
3. Study of the dynamics of second order system
4. Implementation of buck and boost dc-dc converters
5. Study on the design of PI controllers and stability analysis for a DC-DC buck Converter
6. Sine-PWM techniques for single-phase half-bridge, full-bridge and three-phase inverters
7. Economic Load Dispatch of (i) Thermal Units and (ii) Thermal Plants using Conventional method
8. Transient Stability Analysis of Power Systems using Equal Area Criterion (EAC)
9. Reactive Power Control in a transmission system (Ferranti effect, Effect of shunt Inductor)
10. Fault studies using Z_{bus} matrix
11. Design of virtual PMU
12. Wide area control of Two area Kundur system

COURSE OUTCOMES

On successful completion of the course, students will be able to		Pos
CO1	Understand the basic concepts of Electrical Engineering.	**PO1, PO2,PO3**
CO2	Apply the concepts to design MATLAB models	**PO1, PO2, P03, PO4**
CO3	Analyze various Electrical engineering applications through MATLAB.	**PO1, PO2, P03**
CO4	Develop real time models using MATLAB.	**PO1, PO2, P03**
CO5	Design virtual PMU.	**PO1, PO2**

REFERENCE WEBSITE:

1. http://vem-iitg.vlabs.ac.in/
2. https://vp-dei.vlabs.ac.in/Dreamweaver/

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	-
CO.2	3	3	2	2	-	-	-	-	-	-	-	-
CO.3	3	3	2	-	-	-	-	-	-	-	-	-
CO.4	3	2	2	-	-	-	-	-	-	-	-	-
CO.5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.5**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

23MAC351U	TECHNICAL PAPER WRITING & IPR (Skill Enhancement course)	L T P C 2 0 0 0

COURSE OBJECTIVES: ·

1. To enable the students to practice the basic skills of research paper writing
2. To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
3. To practice the basic skills of performing quality literature review
4. To help them in knowing the significance of real-life practice and procedure of Patents.
5. To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks

UNIT – I:

Principles of Technical Writing: styles in technical writing; clarity, precision, coherence and logical sequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings-discussing your limitations -hedging and criticizing -plagiarism and paraphrasing.

UNIT – II:

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature- Problems and Framing Research Questions- Synopsis.

UNIT – III:

Process of research: publication mechanism: types of journals- indexing-seminars-conferences- proof reading – plagiarism style; seminar & conference paper writing; Methodology-discussion-results- citation rules.

UNIT – IV:

Introduction to Intellectual property: Introduction, types of intellectual property, International organizations, agencies and ties, importance of intellectual property rights

de Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and uating trade mark, trade mark registration processes.

UNIT – V:

Law of copy rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer. Patent law, intellectual property audits.

COURSE OUTCOMES

On successful completion of the course, students will be able to		Pos
CO1	Identify key secondary literature related to their proposed technical paper writing	PO1, PO2,PO3
CO2	Explain various principles and styles in technical writing	PO1, PO2, P03, PO4
CO3	Use the acquired knowledge in writing a research/technical paper	PO1, PO2, P03
CO4	Analyse rights and responsibilities of holder of Patent, Copyright, Trademark, International Trademark etc.	PO1, PO2, P03
CO5	Evaluate different forms of IPR available at national & international Level	PO1, PO2

TEXTBOOKS:

1. Deborah. E. Bouchoux, *Intellectual Property Rights*, Cengage Learning India, 2013
2. Meenakshi Raman, Sangeeta Sharma. *Technical Communication: Principles and practices.* Oxford.

REFERENCE BOOKS:

1. R.Myneni, Law of Intellectual Property, 9th Ed, Asia law House, 2019.
2. Prabuddha Ganguli, Intellectual Property Rights Tata Mcgraw Hill, 2001
3. P. Naryan, Intellectual Property Law, 3rd Ed, Eastern Law House, 2007.
4. Adrian Wallwork. English for Writing Research Papers Second Edition. Springer Cham Heidelberg New York ,2016
5. Dan Jones, Sam Dragga, Technical Writing Style

Online Resources

1. https://theconceptwriters.com.pk/principles-of-technical-writing/
2. https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html
3. https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html
4. https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper-journal/
5. https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	-
CO.2	3	3	2	2	-	-	-	-	-	-	-	-
CO.3	3	3	2	-	-	-	-	-	-	-	-	-
CO.4	3	2	2	-	-	-	-	-	-	-	-	-
CO.5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.5**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

III B.Tech. - VI Semester

		L	T	P	C
23EEE361P	**DOMAIN SPECIFIC WORKSHOP (Common to All Branches)**	-	-	-	0

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. To provide students with hands-on exposure to advanced and emerging technologies relevant to their domain of study.
2. To enhance practical knowledge, technical competency, and industry-oriented skills through intensive workshop sessions.
3. To bridge the gap between academic learning and current industrial practices by engaging students in application-based learning experiences.

INSTRUCTION GUIDELINES:

1. A Department Specific Workshop (DSW) shall be conducted after the completion of the III Year – V Semester.
2. The details of the workshop shall be reflected in the III Year – VI Semester marks memorandum with "0" credits.
3. Every student shall undergo a One-Week Domain Specific Workshop after the completion of the III Year – V Semester examinations. The workshop shall focus on advanced and emerging technologies relevant to the respective department/discipline.
4. Participation in the workshop is mandatory for all students. Attendance shall be recorded for all sessions conducted during the workshop period.
5. An examination for 50 marks shall be conducted on the last day of the workshop. A student must secure a minimum of 40% marks (20 out of 50) to qualify for the successful completion certificate.
6. Students who fail to secure the minimum qualifying marks shall appear for a supplementary examination in the subsequent semester.
7. The workshop shall be organized by the respective department in association with industry experts, academic professionals, or recognized training organizations, wherever applicable.
8. The concerned department shall maintain a Complete Program Report (CPR) comprising the workshop brochure, invitation letters to resource persons, bio-data of the experts, session-wise reports with attendance records, photographic evidence, participant feedback analysis, and detailed session-wise content coverage. The complete report shall be preserved in the department for academic and accreditation purposes. Further, the award list of shall be submitted to the Examination Section for the further necessary academic processing.
9. The evaluation and certification process shall be monitored by the concerned department and approved by the Head of the Institution.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Demonstrate knowledge of advanced concepts, tools, and technologies related to the selected domain-specific workshop.	**PO1**
CO2	Analyze real-world engineering problems using appropriate domain-specific techniques and methodologies.	**PO2**
CO3	Design and develop simple solutions, models, or applications using the tools and technologies covered in the workshop.	**PO3**
CO4	Apply modern engineering and IT tools effectively for solving domain-related problems.	**PO5**
CO5	Understand and follow professional ethics, safety practices, and responsible conduct while carrying out workshop activities.	**PO8**
CO6	Work effectively as an individual and as a member of a multidisciplinary team during hands-on sessions and project activities.	**PO9**
CO7	Communicate technical ideas, observations, and outcomes effectively through reports, presentations, and discussions.	**PO10**
CO8	Recognize the need for continuous learning and skill enhancement in emerging technologies relevant to their professional career.	**PO12**

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	3	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**-**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

IV BTECH VII SEM

23EEE471T **POWER SYSTEM OPERATION AND CONTROL**

L	T	P	C
2	1	0	3

PRE-REQUISITES: Power System Analysis

COURSE EDUCATIONAL OBJECTIVES:

1. Optimal Operation of Thermal Power Stations.
2. Hydrothermal Scheduling.
3. Modelling of Turbines and Generators.
4. Load frequency control of Single Area and Two Area Systems.
5. The Shunt and Series Reactive Power Compensations in Power Systems.
6. The Key Aspects of Power System Deregulation.

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UNIT I: OPTIMUM OPERATION THERMAL POWER STATION: (9)

Optimum Operation of Thermal Power Station: Heat Rate Curve – Cost Curve – Incremental Fuel Rate – Incremental Fuel Cost and Production Cost, Input – Output Characteristics of Thermal Power Stations and Hydro Power Stations. Optimum Generation Allocation of Thermal Units without Transmission Line Losses and Optimum Generation Allocation with effect of Transmission Line Losses. Transmission Line Loss Formula, Loss coefficients, Numerical Problems.

UNIT II: ECONOMIC OPERATION OF HYDRO – THERMAL SCHEDULING: (9)

Optimum Operation of Hydrothermal Power Stations: Hydrothermal Coordination Methods – Optimal power flow problem formulation for loss and cost minimization, Solution of optimal power flow problem using Newton‛s method and Linear Programming technique – Numerical problems.

UNIT III: LOAD FREQUENCY CONTROL: (9)

Modelling of Turbine & Governor: The first order Turbine model, Block Diagram representation of Steam Turbines and approximate Linear models, Mathematical Modelling of Speed Governing Systems – Derivation of small Signal Transfer function – Block Diagram.

Single Area Load Frequency Control: Necessity of Keeping Frequency constant, Definition of Control Area – Single Area Control – Block Diagram representation of an Isolated Power System – Steady State Analysis – Dynamic Response – Controlled & Uncontrolled case.

Two Area Load Frequency Control: Load Frequency control of Two Area system – Controlled and Uncontrolled case, Tie – Line Bias Control. 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 CONTROL: (9)

Overview of Reactive Power Control – Reactive Power Compensation in Transmission Systems – Advantages and Disadvantages of Different Types of Compensating Equipment for Transmission Systems; Load Compensation – Specifications of Load Compensator, Uncompensated and Compensated Transmission Lines: Shunt and Series Compensation.

UNIT V: POWER SYSTEM DEREGULATION: (9)

Principle of economics, utility functions, power exchanges, electricity market models, market power indices, ancillary services, transmission and distribution charges, principles of transmission charges, transmission pricing methods, demand-side management, regulatory framework – Numerical problems.

TOTAL HOURS: 45

COURSE OUTCOME:

On successful completion of the course, students will be able to		Pos
CO1	To Understand the Thermal Station Characteristics and Economic Dispatch Problem of Thermal Units	PO1, PO2,PO3
CO2	To Develop the First Order Models of Turbine, Governor and Generator Load Model.	PO1, PO2, P03, PO4
CO3	To Evaluate the Steady State & Dynamic Analysis of Single Area and Two Area Load Frequency Control.	PO1, PO2, P03
CO4	To Analyse the Series & Shunt Reactive Power Compensation in Transmission and Load Systems.	PO1, PO2, P03
CO5	To Understand the Aspects of Power System Deregulation.	PO1, PO2

TEXT BOOKS:

1. Modern Power System Analysis, D.P.Kothari and I.J.Nagrath, Tata McGraw Hill Publishing Company Ltd.,
2. Electric Energy Systems Theory: An Introduction, Olle I. Elgerd, TMH Publishing Company Ltd., New Delhi, 2nd edition, 1983.

REFERENCE BOOKS:

1. Power Generation, Operation and Control, Allen J. Wood and Bruce F. Wollenberg, John Wiley & Sons, Inc., New York, 2nd edition, 1996.
2. Reactive Power Control in Electric Systems, T J E Miller, John Wiley & Sons, New York, 1982.
3. Power System Analysis Operation and Control, Abhijit Chakrabarti and Sunita Halder, PHI Learning Pvt. Ltd. 3rd Edition, 2010.

REFERNCE LINK

1. https://archive.nptel.ac.in/courses/108/104/108104052
2. http://kcl.digimat.in/nptel/courses/video/108104191/L01.html

CO-PO Mapping:

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

IV BTECH VII SEM

		L	T	P	C
23HSM471A	**BUSINESS ETHICS AND CORPORATE GOVERNANCE (Common to All Branches)**	**4**	**0**	**0**	**3**

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES: The objectives of this course are

1. To make the student understand the principles of business ethics
2. To enable them in knowing about the ethics in management
3. To facilitate the student' role in corporate culture
4. To impart knowledge about the legal Frame-work
5. To provide awareness about the corporate governance

UNIT-I: INTRODUCTION TO ETHICS (9)

Ethics Introduction – Meaning – Nature, Scope, significance, Loyalty, and ethical behavior. Value systems - Business Ethics - Types, Characteristics, Factors, Contradictions and Ethical Practices in Management Corporate Social Responsibility – Issues of Management – Crisis Management.

UNIT-II: ETHICS IN MANAGEMENT (9)

Ethics in production, finance, Human resource management and Marketing Management - The Ethical Value System – Universalism, Utilitarianism, Distributive Justice, Social Contracts, Individual Freedom of Choice, Professional Codes; Culture and Ethics – Ethical Values in different Cultures - Culture and Individual Ethics – professional ethics and technical ethics.

UNIT-III: CORPORATE CULTURE (9)

Introduction - Meaning, definition, Nature, and significance – Key elements of corporate culture, shared values, beliefs and norms, rituals, symbols and language - Types of corporate culture, hierarchical culture, market driven culture – Organization leadership and corporate culture, leadership styles and their impact on culture, transformational leadership and culture change.

UNIT- IV: LEGAL FRAME WORK (9)

Law and Ethics -Agencies enforcing Ethical Business Behavior - Legal Impact – Environmental Protection, Fair Trade Practices, legal Compliances, Safeguarding Health and wellbeing of Customers – Corporate law, Securities and financial regulations, corporate governance codes and principles.

UNIT -V: CORPORATE GOVERNANCE (9)

Introduction - Meaning – Corporate governance code, transparency & disclosure -Role of auditors, board of directors and shareholders. Global issues, accounting and regulatory frame work - Corporate scams - Committees in India and abroad, corporate social responsibility. BoDs composition, Cadbury Committee Various committees - Reports - Benefits and Limitations.

COURSE OUTCOMES:

At the end of the course, students will be able to		POS
CO1	Understand the Ethics and different types of ethics.	**PO6, PO8,PO9,PO10,PO12**
CO2	Understand business ethics and ethical practices in management	**PO6,PO8,PO9,PO10,PO 12**
CO3	Understand the role of ethics in management	**PO6, PO8,PO9,PO10,PO12**

CO4	Apply the knowledge of professional ethics & technical ethics	**PO6, PO8,PO9, PO10,PO12**
CO5	Analyze corporate law, ethics, codes & principles, Evaluate corporate governance & corporate scams	**PO6, PO8,P10,PO12**

TEXT BOOKS:

1. Murthy CSV: Business Ethics and Corporate Governance, HPH July 2017
2. Bholananth Dutta, S.K. Podder – Corporation Governance, VBH. June 2010

REFERENCE BOOKS:

1. Dr. K. Nirmala, KarunakaraReaddy. Business Ethics and Corporate Governance, HPH
2. H.R.Machiraju: Corporate Governance, HPH, 2013
3. K. Venkataramana, Corporate Governance, SHBP.
4. N.M.Khandelwal. Indian Ethos and Values for Manager

REFERENCE WEBSITE:

1. https://onlinecourses.nptel.ac.in/noc21_mg46/
2. https://archive.nptel.ac.in/courses/110/105/110105138/
3. https://onlinecourses.nptel.ac.in/noc21_mg54/
4. https://onlinecourses.nptel.ac.in/noc22_mg54/
5. https://archive.nptel.ac.in/courses/109/106/109106117/

CO-PO MAPPING

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

23HSM471B	**E-BUSINESS**	**L**	**T**	**P**	**C**
	(COMMON TO ALL BRANCHES OF ENGINEERING)	**3**	**-**	**-**	**3**

PRE - REQUSITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To provide knowledge on emerging concept on E-Business related aspects
2. To understand various electronic markets & business models.
3. To impart the information about electronic payment systems & banking.
4. To create awareness on security risks and challenges in E-commerce.
5. To make the students aware on different e-marketing channels & strategies

UNIT – I: ELECTRONIC BUSINESS: (9)

Introduction – Nature, meaning, significance, functions and advantages - Definition of Electronic Business - Functions of **Electronic Commerce** (EC)-Advantages & Disadvantages of E-Commerce – E-Commerce and E-Business, Internet Services, Online Shopping- E-Commerce Opportunities for Industries.

UNIT – II: ELECTRONIC MARKETS AND BUSINESS MODELS: (9)

Introduction –E-Shops-E-Malls E-Groceries - Portals - Vertical Portals-Horizontal Portals - Advantages of Portals -Business Models**- Business to Business (B2B)-**Business to Customers (B2C) - Business to Government(B2G)-Auctions-B2B Portals in India

UNIT – III: ELECTRONIC PAYMENT SYSTEMS: (9)

Introduction to electronic payment systems (EPS) -Types of electronic payments - Credit/debit cards, e- wallets, UPI, and crypto currencies -Smart cards and digital wallets: Features and usage - **Electronic Fund Transfer (EFT):** Role in business transactions -Infrastructure requirements and regulatory aspects of e-payments

UNIT – IV: E-SECURITY: (9)

Security risks and challenges in electronic commerce - Cyber threats - Phishing, hacking, identity theft, and malware - Digital Signatures & Certificates - Security protocols over public networks (HTTP, SSL, TLS) - Firewalls in securing e-business platforms.

UNIT – V: E-MARKETING: (9)

Introduction – Online Marketing – Advantages of Online Marketing – Internet Advertisement – Advertisement Methods – Conducting Online Market Research– – E-marketing planning: Online branding, social media marketing, and email marketing - E-business strategies: Digital advertising, content marketing, and analytics, E-Customer Relationship Management (e CRM) E-supply chain management (e-SCM)

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, student will be able to		POs
CO1	Outline the concept of E-Business & its scope and functions.	**PO9,PO11,PO12**
CO2	Apply the E-market-Models in various business situations and organizations	**PO9,PO11,PO12**
CO3	Analyze the various E-payment systems & importance of net banking	**PO8,PO9, PO11,PO12**
CO4	Demonstrate the knowledge gained in E -security and its challenges	**PO1,PO6,PO8, PO9, PO11,PO12**
CO5	Evaluate market research strategies& E-advertisements.	**PO8,PO9,PO10, PO11,PO12**

Text Books:

1. Arati Oturkar & Sunil Khilari. E-Business. Everest Publishing House, 2022
2. P.T.S Joseph. E-Commerce, Fourth Edition, Prentice Hall of India, 2011

Reference Books:

1. Debjani, Kamalesh K Bajaj. E-Commerce, Second Edition Tata McGraw-Hill‘s, 2005
2. Dave Chaffey.E-Commerce E-Management, Second Edition, Pearson, 2012.
3. Henry Chan. E-Commerce Fundamentals and Application, Raymond Leatham Wiley India 2007
4. S. Jaiswal. E-Commerce Galgotia Publication Pvt Ltd., 2003.

REFERENCE WEBSITE:

1.https://www.slideshare.net/fatimahAlkreem/e-businessppt-67935771

2.https://www.slideshare.net/VikramNani/e-commerce-business-models

3.https://www.slideshare.net/RiteshGoyal/electronic-payment-system

4.https://www.slideshare.net/WelingkarDLP/electronic-security

CO-PO MAPPING

CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	-	-	-	-	-	-	-	-	2	-	3	3
CO2	-	-	-	-	-	-	-	-	2	-	3	3
CO3	-	-	-	-	-	-	-	2	3	-	3	3
CO4	2	-	-	-	-	2	-	2	3	-	3	3
CO5	-	-	-	-	-	-	-	2	2	3	3	3
CO	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**2**	**2.6**	**3**	**3**	**3**

23HSM471C	Management Science (Common to All Branches)	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. To provide fundamental knowledge on Management, Administration, Organization & its concepts;
2. To make the students understand the role of management in Production;
3. To impart the concept of HRM in order to have an idea on Recruitment, Selection, Training & Development, Job Evaluation and Merit Rating concepts;
4. To create awareness on identify Strategic Management areas & the PERT/CPM for better Project Management;
5. To make the students aware of the contemporary issues in modern management.

UNIT- I INTRODUCTION TO MANAGEMENT (9)

Management - Concept and meaning - Nature-Functions - Management as a Science and Art and both - Schools of Management Thought - Taylor's Scientific Theory - Henry Fayol's principles - Elton Mayo's Human relations - Organizational Designs - Line organization - Line & Staff Organization - Functional Organization - Matrix Organization - Project Organization - Committee form of Organization - Social Responsibilities of Management.

UNIT - II OPERATIONS MANAGEMENT (9)

Principles and Types of Plant Layout - Methods of Production (Job, batch and Mass Production), Work Study - Statistical Quality Control- Material Management - Objectives Inventory-Functions - Types, Inventory Techniques – EOQ - ABC Analysis - Marketing Management - Concept - Meaning – Nature - Functions of Marketing - Marketing Mix - Channels of Distribution - Advertisement and Sales Promotion - Marketing Strategies based on Product Life Cycle.

UNIT - III HUMAN RESOURCES MANAGEMENT (HRM) (9)

HRM - Definition and Meaning – Nature - Managerial and Operative Functions - Job Analysis - Human Resource Planning (HRP) - Employee Recruitment - Sources of Recruitment - Employee Selection - Process - Employee Training and Development - Methods - Performance Appraisal Concept - Methods of Performance Appraisal – Placement - Employee Induction - Wage and Salary Administration.

UNIT - IV STRATEGIC & PROJECT MANAGEMENT (9)

Definition & Meaning - Setting of Vision - Mission - Goals - Corporate Planning Process - Environmental Scanning - Steps in Strategy Formulation and Implementation - SWOT Analysis - Project Management - Network Analysis - Programme Evaluation and Review Technique (PERT) - Critical Path Method (CPM) Identifying Critical Path - Probability of Completing the project within given time - Project Cost- Analysis - Project Crashing (Simple problems).

UNIT - V CONTEMPORARY ISSUES IN MANAGEMENT (9)

Customer Relations Management (CRM) - Total Quality Management (TQM) - Six Sigma Concept - Supply Chain Management (SCM) - Enterprise Resource Planning (ERP) - Performance Management – Employee Engagement and Retention - Business Process Re-engineering and Bench Marking - Knowledge Management – Change Management –Sustainability and Corporate Social Responsibility.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Remember the concepts & principles of management and designs of organization in a practical world	**PO6, PO9, PO10,PO11,PO12**
CO2	Understand the knowledge of Work-study principles & Quality Control techniques in industry	**PO2,PO9,PO10, PO11,PO12**
CO3	Apply the process of Recruitment & Selection in organization.	**PO9,PO10, PO11,PO12**
CO4	Analyze the concepts of HRM & different training methods.	**PO2,PO3,PO4,PO5, PO9, PO10, PO11,PO12**
CO5	Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time & cost of project & to analyze the business through SWOT	**PO2,PO3,PO4,PO5, PO6,PO7,PO8,PO9, PO10, PO11,PO12**

TEXT BOOKS:

1. Frederick S. Hillier, Mark S. Hillier. Introduction to Management Science, October 26, 2023.
2. A.R Aryasri, Management Science, TMH, 2019

REFERENCE BOOKS:

1. Stoner, Freeman, Gilbert. Management, Pearson Education, New Delhi, 2019.
2. Introduction to Management Science, 12e, Bernard W. Taylor, Pearson Education, New Delhi, 2016
3. Koontz & Weihrich, Essentials of Management, 6/e, TMH, 2005.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
5. Samuel C.Certo, Modern Management, 9/e, PHI, 2005
6. R.K. Rajput, "A Textbook of Manufacturing Technology: Manufacturing Processes", 2/e, Laxmi Publications (P) Ltd., New Delhi, 2017.

REFERENCE WEBSITE:

1. https://www.slideshare.net/slideshow/introduction-to-management-and-organization231308043/23130804
2. https://nptel.ac.in/courses/112107238
3. https://archive.nptel.ac.in/courses/110/104/110104068/
4. https://archive.nptel.ac.in/courses/110/105/110105069/
5. https://onlinecourses.nptel.ac.in/noc24_mg112

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	-	3	2	2	3
CO2	-	2	-	-	-	-	-	-	2	2	2	3
CO3	-	-	-	-	-	-	-	-	3	2	2	3
CO4	-	2	2	2	2	-	-	-	2	2	2	3
CO5	-	2	2	2	2	2	2	3	2	2	2	3
CO*	**-**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**2.6**	**2**	**2**	**3**

23EEE472A	**ELECTRIC VEHICLE TECHNOLOGY (Professional Elective - IV)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

PRE-REQUISITES: Power Electronics

COURSE EDUCATIONAL OBJECTIVES:

1. Illustrate electric vehicles.
2. Understand drive-train topologies.
3. Classify various electrical drive.
4. Classify energy storage technologies.
5. Classify different energy management strategies.

UNIT-I: INTRODUCTION TO ELECTRIC VEHICLES: (9)
History of electric vehicles, social and environmental importance of electric vehicles, impact of modern drive-trains on energy supplies.

CASE STUDY Comparison by efficiency of Conventional, Hybrid, Electric and Fuel cell Vehicles.

UNIT-II: ELECTRIC DRIVE-TRAINS: (9)
Basic concept of electric traction, Introduction to various electric drive-train topologies, Power flow control in electric drive-train topologies.

UNIT-III: ELECTRIC DRIVES & CONTROL: (9)
Introduction to electric components used in electric vehicles, Control of BLDC Motor, Control of Induction Motor Drive, Permanent Magnet (PM) motor Drive & Switched Reluctance Motor (SRM) Drive.

UNIT-IV: ENERGY STORAGE: (9)
Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its modeling, SOC, Different Types of Batteries, Super Capacitor based energy storage and its analysis, Fuel Cells, Hybridization of different energy storage devices.

UNIT-V: ENERGY MANAGEMENT STRATEGIES & CHARGING INFRASTRUCTURE: (9)

Introduction to energy management strategies used in electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies, Types of EV charging Infrastructure & Standardized Communication protocols for EV charging.

CASE STUDIES
Current issues in electric Vehicles, Thermal Protection of Battery.

TOTAL HOURS: 45

On successful completion of the course, students will be able to		Pos
CO1	Illustrate electric vehicles.	**PO1, PO2**
CO2	Understand drive-train topologies.	**PO1, PO2**
CO3	Classify various electrical drives.	**PO1, PO2**
CO4	Classify energy storage technologies.	**PO1, PO2**
CO5	Classify different energy management strategies.	**PO1, PO2**

TEXT BOOKS:

1. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, ―Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design , CRC Press, 2 ‖ nd Edition, 2017. (Unit-I, II)
2. Ali Emadi, ―Advanced Electric Drive Vehicles (Energy, Power Electronics, and Machines) ,‖ CRC Press, 2015.
3. John G. Hayes and A. Goodarzi, ―Electric Powertrain - Energy Systems, Power electronics and drives for Hybrid, electric and fuel cell vehicles , Wiley, 2018. (Unit-IV‖ & V)

REFERENCE BOOKS:

1. James Larminie, John Lowry, ―Electric Vehicle Technology Explained ,‖ Wiley, 2 nd Edition 2012.

REFERNCE LINK

https://nptel.ac.in/courses/108106170
https://onlinecourses.nptel.ac.in/noc22_ee53
https://onlinecourses.nptel.ac.in/noc21_ee112

CO-PO Mapping:

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

		L	T	P	C
23EEE472B	**HVDC AND FACTS (Professional Elective - IV)**	**3**	**0**	**0**	**3**

PRE-REQUISITES: Power Electronics

COURSE EDUCATIONAL OBJECTIVES:

1. High voltage DC transmission systems.
2. Flexible AC transmission systems.
3. Various configurations of the above, Principle of operation, Characteristics of various FACTS devices

UNIT I: INTRODUCTION: (9)

Electrical Transmission Networks, Conventional Control Mechanisms-Automatic Generation Control, Excitation Control, Transformer Tap-Changer Control, Phase-Shifting Transformers; Advances in Power- Electronic Switching Devices, Principles and Applications of Semiconductor Switches; Limitations of Conventional Transmission Systems, Emerging Transmission Networks, HVDC and FACTS. Concepts of virtual inertia.

UNIT II: HIGH VOLTAGE DC TRANSMISSION – I: (9)

Types of HVDC links - Monopolar, Homopolar, Bipolar and Back-to-Back, Advantages and disadvantages of HVDC Transmission, Analysis of Graetz circuit, Analysis of bridge circuit without overlap, Analysis of bridge with overlap less than 60^0, Rectifier and inverter characteristics, complete characteristics of rectifier and inverter, Equivalent circuit of HVDC Link.

UNIT III: HIGH VOLTAGE DC TRANSMISSION – II: (9)

Desired features and means of control, control of the direct current transmission link, Constant current control, Constant ignition angle control, Constant extinction angle control, Converter firing angle control- IPC and EPC, frequency control and Tap changer control, Starting, Stopping and Reversal of power flow in HVDC links.

UNIT IV: FLEXIBLE AC TRANSMISSION SYSTEMS-I: (9)

Types of FACTS Controllers, brief description about various types of FACTS controllers, Operation of 6pulse converter, Transformer Connections for 12-pulse, 24-pulse and 48-pulse operation, principle of operation of various types of Controllable shunt VAR Generation, Principle of switching converter type shunt compensator, principles of operation of various types of Controllable Series VAR Generation, Principle of Switching Converter type series compensator.

UNIT V: FLEXIBLE AC TRANSMISSION SYSTEMS-II: (9)

Unified Power Flow Controller (UPFC) – Principle of operation, Transmission Control Capabilities, Independent Real and Reactive Power Flow Control; Interline Power Flow Controller (IPFC) –

Principle of operation and Characteristics, UPFC and IPFC control structures (only block diagram description), objectives and approaches of voltage and phase angle regulators

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Remember various conventional control mechanisms, transmission networks.	**PO1**
CO2	Understand the necessity of HVDC systems as emerging transmission networks.	**PO1, PO2**
CO3	Understand the necessity of reactive power compensation devices.	**PO1, PO2**
CO4	Design equivalent circuits of various HVDC system configurations.	**PO1, PO2, P03, PO4, PO5**
CO5	Design and analysis of various FACTS devices.	**PO1, PO2, P03, PO4, PO5**

TEXT BOOKS:

1. Narain G. Hingorani and Laszlo Gyugyi, Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems, IEEE Press, Wiley Interscience, New Jersey, 2000.
2. E.W. Kimbark, Direct current transmission, Vol. I, Wiley Interscience, New York,1971.

REFERENCE BOOKS:

1. KRPadiyar, FACTS Controllers in Power Transmission and Distribution, New Age International Publishers, New Delhi, 2007.
2. AnriqueAcha, Claudio R. Fuerte-Esquivel, Hugo Ambriz-Pérez and César Angeles-Camacho, FACTS: Modelling and Simulation in Power Networks, John Wiley & Sons, West Sussex, 2004.
3. R Mohan Mathur and Rajiv K Varma, Thyristor-Based FACTS Controllers for Electrical Transmission Systems, IEEE Press, Wiley-Interscience, New Jersey, 2002.

REFERNCE LINK

1. https://nptel.ac.in/courses/108104013, https://nptel.ac.in/courses/108107114

CO-PO Mapping:

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

23EEE472C	**POWER SYSTEM TRANSIENTS** **(Professional Elective Course-5)**	**L T P C** **3 0 0 3**

PRE-REQUISITES: A Course on Network Analysis

COURSE EDUCATIONAL OBJECTIVES:

1. Study the generation of switching transients and their control using circuit theoretical concept.
2. Study the mechanism of switching transients and their adverse effects.
3. Study the mechanism of lighting strokes and the production of lighting surges.
4. Study the propagation, reflection and refraction of travelling waves.
5. Study the impact of voltage transients caused by faults, circuit breaker action,
6. and load rejection on integrated power system.

UNIT -1: INTRODUCTION AND SURVEY (9)

Review and importance of the study of transients – causes for transients. RL circuit transient with sine wave excitation – double frequency transients – basic transforms of the RLC circuit transients. Different types of power system transients – effect of transients on power systems-role of the study of transients in system planning.

UNIT -2: SWITCHING TRANSIENTS (9)

Over voltages due to switching transients – resistance switching and the equivalent circuit for interrupting the resistor current – load switching and equivalent circuit – waveforms for transient voltage across the load and the switch – normal and abnormal switching transients. Current suppression – current chopping– effective equivalent circuit. Capacitance switching – effect of source regulation – capacitance switching with a restrike, with multiple restrikes.

UNIT -3: LIGHTNING TRANSIENTS (9)

Review of the theories in the formation of clouds and charge formation – rate of charging of thunder clouds – mechanism of lightning discharges and characteristics of lightning strokes – model for lightning stroke – factors contributing to good line design – protection using ground wires – tower footing resistance – interaction between lightning and power system.

UNIT-4: TRAVELING WAVES ON TRANSMISSION LINE (9)

Computation of transients – transient response of systems with series and shunt lumped parameters and distributed lines. Traveling wave concept – step response – Bewley's lattice diagram – standing waves and natural frequencies – reflection and refraction of travelling waves.

UNIT -5: TRANSIENTS IN INTEGRATED POWER SYSTEM (9)

The short line and kilometric fault – distribution of voltages in a power system – line dropping and load rejection – voltage transients on closing and reclosing lines – over voltage induced by faults – switching surges on integrated system – Quantitative application of EMTP for transient computation.

TOTAL HOURS: 45

On successful completion of the course, students will be able to		Pos & PSOs
CO1	Study the generation of circuit transients and their control using circuit– theoretical concept.	**PO1, PO2, PO4**
CO2	Acquire knowledge on switching transients and their adverse effects.	**PO1,PO2, PO4**
CO3	Acquire knowledge on lighting strokes and the production of lighting surges	**PO1,PO3**
CO4	Understands wave propagation, reflection and refraction of travelling waves	**PO1,PO2, PO3**
CO5	know the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system	**PO1,PO2,PO3,PO4**

TEXT BOOKS:

1. Allan Greenwood, "Electrical transients in Power systems", Wiley
2. Inter Science, New York, 2nd Edition, 1991.
3. Pritindra Chowdhari, "Electromagnetic transients in power systems", John Wiley and Sons, 2nd Edition, 2009.

REFERENCE BOOKS:

1. M.S.Naidu and V.Kamaraju, "High voltage engineering", TMH, 5th Edition, 2013.
2. R.D. Begamudre, "Extra high voltage AC transmission engineering", Wiley Eastern Ltd,.1986.
3. Y.Hase, "Handbook of power system engineering", Wiley India, 2102.
4. C.S. Indulkar, D.P.Kothari, K.Ramalingam, "Power system Transients – A statistical approach", PHI Learning Private Limited, 2nd Edition, 2010.

REFERENCE WEBSITE:

https://nptel.ac.in/courses/108/105/108105104/

CO-PO MAPPING:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	3	-	-	-	-	-	-	-	-
CO2	3	2	-	2	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-
CO*	**3**	**2.5**	**2**	**2**								

IV BTECH VII SEM

23ECE472B	DIGITAL SIGNAL PROCESSING (PROFESSIONAL ELECTIVE IV)	L T P C
		3 0 0 3

PRE-REQUISITES: Signals and Systems

COURSE OBJECTIVES:

1. To get familiar with the properties of discrete time signals, systems and z-transform.
2. To learn the importance of FFT algorithm for computation of Discrete Fourier Transform and Fast Fourier Transform with decimations.
3. To understand the implementations of digital filter structures.
4. To analyse the FIR filter design using Fourier series and windowing methods.
5. To gain the knowledge on Programmable DSP Devices.

UNIT I - DISCRETE TIME SIGNALS AND SYSTEMS & Z- TRANSFORM (9)

Introduction to digital signal processing, Review of discrete-time signals and systems, Analysis of discrete-time linear time invariant systems, frequency domain representation of discrete time signals and systems

Definition, ROC, Properties, Poles and Zeros in Z-plane, the inverse Z Transform, System analysis, Transfer function, BIBO stability, System Response to standard signals.

UNIT II - DISCRETE FOURIER TRANSFORM & FAST FOURIER TRANSFORM (9)

Introduction, Discrete Fourier Series, properties of DFS, Discrete Fourier Transform, Inverse DFT, properties of DFT, Linear and Circular convolution, convolution using DFT, sampling, Quantization effects.

Introduction, Fast Fourier Transform, Radix-2 Decimation in time and Decimation in frequency FFT, Inverse FFT (Radix-2).

UNIT III – IIR FILTERS (9)

Introduction to digital filters, Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters by Impulse invariant and bilinear transformation methods, Frequency transformations, Basic structures of IIR Filters - Direct form I, Direct form-II, Cascade form and Parallel form realizations.

UNIT IV – FIR FILTERS (9)

Introduction, Characteristics of FIR filters with linear phase, Frequency response of linear phase FIR filters, Design of FIR filters using Fourier series and windowing methods (Rectangular, Triangular, Raised Cosine, Hanging, Hamming, Blackman), Comparison of IIR & FIR filters, Basic structures of FIR Filters – Direct form, Cascade form, Linear phase realizations.

UNIT V – ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES (9)

Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals.

TOTAL HOURS:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Familiar with the properties of discrete time signals, systems and z-transform.	**PO1, PO2**
CO2	Learn the importance of FFT algorithm for computation of Discrete Fourier Transform and Fast Fourier Transform with decimations.	**PO1, PO2, PO3**
CO3	Understand the implementations of digital filter structures.	**PO1, PO2**
CO4	Analyse the FIR filter design using Fourier series and windowing methods.	**PO1, PO2, PO3**
CO5	Gain the knowledge on Programmable DSP Devices.	**PO1, PO2**

TEXT BOOKS:

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

REFERENCE BOOKS:
1. S.K.Mitra, Digital Signal Processing – A practical approach, 2nd Edition, Pearson Education, New Delhi, 2004.
2. MH Hayes, Digital Signal Processing, Schaum's Outline series, TATA Mc-Graw Hill, 2007. 3. Robert J. Schilling, Sandra L. Harris, Fundamentals of Digital Signal Processing using Matlab, Thomson, 2007.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	-	-	-	-	-	-	-	-	-	-
CO.2	3	3	2	-	-	-	-	-	-	-	-	-
CO.3	3	3	-	-	-	-	-	-	-	-	-	-
CO.4	3	3	3	-	-	-	-	-	-	-	-	-
CO.5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

IV BTECH VII SEM

23EEE473A	**ELECTRICAL DISTRIBUTION SYSTEM (Professional Elective-V)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

PRE-REQUISITES

COURSE EDUCATIONAL OBJECTIVES:

1. To know about fundamental aspects of distribution system, principle of distribution substations.
2. To know about classification of various loads.
3. To understand difference between conventional load flow studies of power system and distribution system load flow.
4. To know about evaluation of voltage droop and power loss calculations, distribution automation and management system, SCADA.

UNIT I: DISTRIBUTION SYSTEM FUNDAMENTALS: (9)

Brief description about electrical power transmission and distribution systems, Different types of distribution sub-transmission systems, Substation bus schemes, Factors effecting the substation location, Factors effecting the primary feeder rating, types of primary feeders, Factors affecting the primary feeder voltage level, Factors effecting the primary feeder loading.

UNIT II: DISTRIBUTION SYSTEM SUBSTATIONS AND LOADS: (9)

Substations: Rating of a distribution substation for square and hexagonal shaped distribution substation, Service area with ―n‖ primary feeders, K constant, Radial feeder with uniformly and non-uniformly distributed loading. Benefits derived through optimal location of substations. **Loads:** Various types of loads, Definitions of various terms related to system loading, Distribution transformer loading, feeder loading, Relationship between the Load Factor and Loss Factor, Modelling of star and delta connected loads.

UNIT III: DISTRIBUTION SYSTEM LOAD FLOW: (9)

Exact line segment model, Modified line model, approximate line segment model, Step-Voltage Regulators, Line drop compensator, Forward/Backward sweep distribution load flow algorithm – Numerical problems

UNIT IV: VOLTAGE DROP AND POWER LOSS CALCULATION: (9)

Analysis of non-three phase primary lines, concepts of four-wire multi-grounded common-neutral distribution system, Percent power loss calculation, Distribution feeder cost calculation methods, Capacitor installation types, Series and Shunt Capacitors, Types of three-phase capacitor-bank connections, Procedure for best capacitor location, Economic justification for capacitors – Numerical problems.

UNIT V: DISTRIBUTION AUTOMATION: (9)

Distribution automation, distribution management systems, distribution automation system functions, Basic SCADA system, Consumer Information Service (CIS) – Geographical Information System (GIS) – Automatic Meter Reading (AMR), Outage management, decision support applications, substation automation, control feeder automation.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand fundamental aspects of distribution system and various factors affecting the distribution systems.	**PO1, PO2**
CO2	Analysis of substations and modelling of loads.	**PO1, PO2, P03**
CO3	Understand difference between conventional load flow studies of power system and distribution system load flow.	**PO1, PO2**
CO4	Evaluation of voltage drop and power loss calculations and capacitor location and cost analysis.	**PO1,PO2, P03**
CO5	Analyse the concepts of SCADA, Automation distribution system and management.	**PO1,PO2, P03**

Textbooks:

1. Distribution System Modelling and Analysis, William H. Kersting, CRC Press, Newyork, 2002.
2. Electric Power Distribution System Engineering, TuranGonen, McGraw-Hill Inc., New Delhi, 1986.

Reference Books:

1. Control and automation of electrical power distribution systems, James Northcote-Green and Robert Wilson, CRC Press (Taylor & Francis), New York, 2007.
2. Biswarup Das, Power distribution Automation, IET publication, 2016.
3. Dr. M. K. Khedkar, Dr. G.M. Dhole, Electric Power Distribution Automation, Laxmi Publications, First edition, 2017.

Reference Link:

https://onlinecourses.nptel.ac.in/noc22_ee126/preview

CO-PO Mapping:

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

IV BTECH VII SEM

23EEE473B	**MODERN CONTROL THEORY** **(Professional Elective-V)**	**L T P C** **3 0 0 3**

COURSE EDUCATIONAL OBJECTIVES:

1. To introduce the concept of state-space representation and modelling of continuous and discrete linear systems.
2. To analyse system properties using eigenvalues, eigenvectors, controllability, and observability.
3. To develop state feedback controllers and observer designs for regulation and tracking applications.
4. To understand modelling and behavior of nonlinear systems including power electronic applications.
5. To apply stability analysis techniques using classical and Lyapunov-based methods

UNIT:1 Linear Systems

Concept of state: state equations for dynamic systems, state diagrams; Time invariance and linearity; Solution of state equations; state transition matrix; Relation between state model and transfer function; Modelling of linear systems; Discrete state variable analysis

UNIT:2 Analysis of Linear Systems

Eigen values and eigen vectors; system modes; Controllability; Observability; Canonical forms: Minimal realization; Stabilizability and detectability

UNIT:3 State Feedback Control and Observer Design

Design of state feedback control: Regulation and tracking; Design of full order and reduced order observer; Extended state observer; Discrete pole placement and observer design; Simulation tools and case studies

UNIT:4 Nonlinear Systems

Nonlinear dynamics: common nonlinearities, features of nonlinear systems; Modelling of nonlinear systems: equilibrium points, linearization, state space averaging; Nonlinear phenomena in power converters: bifurcation and chaos

UNIT:5 Stability Analysis

Stability of LTI Systems: BIBO stability; Nyquist stability criteria; Stability in the sense of Lyapunov; Lyapunov functions: methods of construction; Stability analysis: Lyapunov direct and indirect method.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Ability to model and analyze dynamic systems using state-space techniques in continuous and discrete domains.	**PO1, PO2**
CO2	Ability to evaluate system characteristics such as controllability, observability, and system modes.	**PO1, PO2, P03**
CO3	Ability to design state feedback controllers and observers for desired system performance.	**PO1, PO2**
CO4	Ability to analyze nonlinear system behavior and perform linearization around operating points.	**PO1,PO2, P03**
CO5	Ability to assess system stability using BIBO, Nyquist, and Lyapunov stability criteria.	**PO1,PO2, P03**

TEXT BOOK:

1. K. Ogata, ―Modern Control Engineering‖, Prentice Hall of India, 2010.
2. G. F. Franklin, J. D. Powell and M Workman, ―Digital Control of Dynamic Systems‖, PHI (Pearson), 2008.

REFERENCE BOOKS:

1. G. F. Franklin, J. D. Powell and A. E. Naeini, ‗Feedback Control of Dynamic Systems 'PHI (Pearson), 2004
2. Loan D. Landau, Gianluca Zito, ‗Digital Control Systems, Design, Identification and Implementation 'Springer, 2006
3. D. Ibrahim, Micro-controller based Applied Digital Control 'John Wiley & Sons Ltd., 2006

CO-PO Mapping:

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

IV BTECH VII SEM

23EEE473C	SWITCHED MODE POWER CONVERSION (Professional Elective-V)	L	T	P	C
		3	0	0	3

PRE-REQUISITES:

COURSE EDUCATIONAL OBJECTIVES:

1. Understand basic concepts of DC-DC converters
2. Understand the concepts of resonant converters and their classification, various types of multilevel inverters, power conditioners, UPS and filters.
3. Apply various modulation and harmonic elimination techniques over the converters.
4. Analyze the state space modelling of various types of converters.
5. Design inductor and transformer for various power electronic applications.

UNIT I : DC-DC CONVERTERS: (9)

Principles of step-down and step-up converters – Analysis and state space modelling of Buck, Boost, Buck- Boost and Cuk converters – Numerical Examples

UNIT II: SWITCHING MODE POWER CONVERTERS: (9)

Analysis and state space modelling of flyback, Forward, Luo, Half bridge and full bridge converters control circuits and PWM techniques – Numerical Examples

UNIT III: RESONANT CONVERTERS: (9)

Introduction- classification- basic concepts- Resonant switch- Load Resonant converters- ZVS, Clamped voltage topologies- DC link inverters with Zero Voltage Switching- Series and parallel Resonant inverters- Voltage control – Numerical Examples

UNIT IV: DC-AC CONVERTERS: (9)

Single phase and three phase inverters, control using various (sine PWM, SVPWM and advanced modulation) techniques, various harmonic elimination techniques- Multilevel inverters- Concepts Types: Diode clamped- Flying capacitor- Cascaded types- Applications.

UNIT V: POWER CONDITIONERS, UPS & FILTERS: (9)

Introduction- Power line disturbances- Power conditioners –UPS: offline UPS, Online UPS, Applications – Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters – Design of inductor and transformer for PE applications – Selection of capacitors.

TOTAL HOURS: 45

COURSE OUTCOME:

On successful completion of the course, students will be able to		Pos
CO1	Remember basic concepts of various converters.	**PO1**
CO2	Understand the problems and to design of various DC-DC converters, advanced converters of SMPCs.	**PO1, PO2**
CO3	Evaluate the performance of resonant converters**.**	**PO1, PO2, P03**
CO4	Analyze the performance characteristics of 1-φ and 3-φ inverters with single/multi levels, power conditioners, UPS and filters.	**PO1, PO2, P03**
CO5	Design various applications of the above in Power Systems, EVE, Renewable Energy Systems, etc.	**PO1, PO2, P03, PO4, PO5**

TEXT BOOKS:

1. Power Electronics: Essentials and Applications by L. Umanand, Wiley, 2009
2. M.H. Rashid – Power Electronics handbook, Elsevier Publication, 2001.
3. Course material on Switched Mode Power Conversion by V Ramanarayanan, Dept. of Electrical Engg. IISc. Bangalore1.

REFERENCE BOOKS:

1. Philip T. Krein, ―Elements of Power Electronics ,‖ Oxford University Press, 2012
2. Ned Mohan, Tore.M.Undeland, William.P.Robbins, Power Electronics converters, Applications and design, 3rd Edition, John Wiley and Sons, 2006
3. M.H. Rashid, Power Electronics circuits, devices and applications, 3rd Edition Prentice Hall of India New Delhi, 2007.

REFERNCE LINK

1. https://nptel.ac.in/courses/108108036
2. https://nptel.ac.in/courses/108105180

CO-PO Mapping:

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

IV BTECH VII SEM

23EEE473D	**SPECIAL ELECTRICAL MACHINES (Professional Elective-V)**	**L T P C** **3 0 0 3**

PRE-REQUISITES: A Course on Electrical Machines

COURSE EDUCATIONAL OBJECTIVES:

1. Demonstrate knowledge on construction and performance of synchronous reluctance motors.
2. Offer knowledge on construction and operation, drive system and circuit control and their modes of operation of stepper motor.
3. Provide knowledge on drive system and circuit control of switched reluctance motor.
4. Afford knowledge on construction and performance of PMBLDC motor.
5. Supply knowledge on construction and performance of permanent magnet **5** synchronous motor and their characteristics

UNIT - 1: SYNCHRONOUS RELUCTANCE MOTORS (9)

Constructional features – Types – Axial and Radial flux motors – Operating principles – Voltage and Torque Equations - Phasor diagram - performance characteristics and Applications–Vernier Motor-Principles of operation.

UNIT 2: STEPPER MOTORS (9)

Constructional features- principle of operation–Types of stepper motor-Modes of operation –Drive circuits –Static and Dynamic Characteristics and Applications. Closed loop and Microprocessor control of stepper motor.

UNIT -3: SWITCHED RELUCTANCE MOTORS (9)

Constructional and Principles of operation - Torque Equation of SRM– drive circuits – Torque speed characteristics. Current control schemes–Microprocessor based control; closed loop and sensor less control of SRM drive –Methods of rotor Position sensing – Applications.

UNIT- 4: PERMANENT MAGNET BRUSH LESS DC MOTORS (9)

Comparison between mechanical and electronic commutators – Principle of operation - driving circuits – Torque and EMF equation – Torque and Speed characteristics –sensor less control of B LDC motors–applications.

UNIT-5: PERMANENT MAGNET SYNCHRONOUS MOTORS (9)

Principles of operation – Constructional features – Phasor diagram – torque speed characteristics – torque and EMF equations –power controllers – applications. Construction and types of Linear Synchronous Motor (LSM) and its applications.

TOTAL HOURS: 45

COURSE OUTCOME:

On successful completion of the course, students will be able to		Pos & PSOs
CO1	Demonstrate knowledge on construction and performance of synchronous reluctance motors	**PO1,PO2,PO3**
CO2	Acquire knowledge on the modes of operation, drive system and circuit control of stepper motor.	**PO1,PO2,PO3**
CO3	Analyze and understand construction and principle of operation of switched reluctance motor.	**PO1,PO2**
CO4	Analyze and understand drive system and circuit control of PMBLDC motor.	**PO1,PO2,PO3**
CO5	Analyze and understand the performance of permanent magnet synchronous motor.	**PO1,PO2**

TEXT BOOKS

1. Venkataratnam K- “Special Electrical Machines” - Universities Press - Hyderabad - 2008.
2. P.P.Acarnley-“Stepping Motors -A Guide to Modern theory and practice" - Peter Peregrines - London - 2002.
3. Dr.P.S.Bhimbra-“Generalized theory of Electrical machines”-Khanna Publishers
4. Sen.P.C.”Principles of Electrical Machines and Power Electronics”, John willey & sons, Second Edition,2008.

REFERENCE BOOKS

1. J. Gnana Vadivel ,Dr.S. Muralidharan-“Principles of Special Electrical Machines” – Anuradha Publications-Chennai.
2. T.J.E. Miller-"Brush less Permanent Magnet and reluctance Motor Drives" – Clarendon Press - Oxford - 1989.Say. M.G
3. ” Alternating current machines” John willey & sons, fifth edition 1983.

REFERENCE WEBSITE

https://nptel.ac.in/courses/108/102/108102156/

CO-PO MAPPING:

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

IV B. Tech–VII Semester

230CE471A	BUILDING MATERIALS ANDSERVICES OPEN ELECTIVE-III	L T P C 3 0 0 3

COURSE EDUCATIONAL OBJECTIVES

1. To understand the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.
2. To analyze the composition, manufacturing process, and properties of cement and admixtures.
3. To apply knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.
4. To evaluate masonry, mortars, finishing techniques, and formwork systems.
5. To assess various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection.

UNIT– 1 **(9)**

Stones and Bricks, Tiles: Building Stones – Classifications and Quarrying – Properties – Structural Requirements – Dressing. Bricks – Composition of Brick Earth – Manufacture and Structural Requirements, Fly Ash, Ceramics. Timber, Aluminum, Glass, Paints and Plastics: Wood - Structure – Types and Properties – Seasoning – Defects; Alternate Materials for Timber – GI / Fiber – Reinforced Glass Bricks, Steel & Aluminum, Plastics.

UNIT– 2 **(9)**

Cement &Admixtures: Types of Cement - Ingredients of Cement – Manufacture – Chemical Composition – Hydration - Field & Lab Tests – Fineness – Consistency– Initial &Final Setting – Soundness. Admixtures – Mineral & Chemical Admixtures – Uses

UNIT– 3 **(9)**

Building Components: Lintels, Arches, Walls, Vaults – Stair Cases – Types of Floors, Types of Roofs – Flat, Curved, Trussed; Foundations – Types; Damp Proof Course; Joinery – Doors – Windows – Materials – Types.

UNIT– 4 **(9)**

Mortars, Masonry and Finishing 's Mortars: Lime and Cement Mortars Brick Masonry – Types – Bonds; Stone Masonry – Types; Composite Masonry – Brick-Stone Composite; Concrete, Reinforced Brick. Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP. form Work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

UNIT– 5 **(9)**

Building Services: Plumbing Services: Water Distribution, Sanitary – Lines &Fittings; Ventilations: Functional Requirements Systems of Ventilations. Air-Conditioning - Essentials and Types; Acoustics – Characteristic – Absorption – Acoustic Design; Fire Protection – Fire Hazards – Classification of Fire-Resistant Materials and Constructions.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	**Understand** the properties, classifications, and applications of building materials like stones, bricks, tiles, wood, aluminum, glass, paints, and plastics.	PO1, PO5
CO2	**Analyze** the composition, manufacturing process, and properties of cement and admixtures.	PO1,PO2,PO5
CO3	**Apply** knowledge of building components such as lintels, arches, walls, stairs, floors, roofs, foundations, and joinery.	PO1, PO3,PO4, PO5
CO4	**Evaluate** masonry, mortars, finishing techniques, and formwork systems.	PO3, PO4,PO5,PO7,
CO5	**Assess** various building services including plumbing, ventilation, air conditioning, acoustics, and fire protection	PO6,PO7,PO8

TEXT BOOKS:

1. Building Materials and Construction – Arora& Bindra, Dhan pat Roy Publications.
2. Building Materials and Construction by G C Sahu, Joy Gopal Jena McGraw hill Pvt Ltd 2015.

REFRENCE BOOKS:

1. Building Construction by B. C. Punima, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi
2. P. C. Varghese, Building Materials, Prentice Hall of India, 2015.
3. N. Subramanian, Building Materials Testing and Sustainability‖, Oxford Higher Education, 2019.
4. R. Chudleigh, Construction Technology, Longman Publishing Group, 1973.
5. S. K. Duggal, Building Materials, Oxford & IBH Publishing Co. Ltd., New Delhi, 2019

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/105/102/105102088/

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	2	-	-	-	-	-	-	-
CO2	3	3	-	-	2	-	-	-	-	-	-	-
CO3	3	-	3	2	3	-	-	-	-	-	-	-
CO4	-	-	3	3	3	-	2	-	-	-	-	-
CO5	-	-	-	-	-	3	3	2	-	-	-	-
CO*	3	3	3	2.5	2.5	3	2.5	2				

IV B. Tech–VII Semester

230CE471B	**ENVIRONMENTAL IMPACT ASSESSMENT** **OPEN ELECTIVE-III**	**L T P C** **3 0 0 3**

COURSE EDUCATIONAL OBJECTIVES

1. Understand the principles, methodologies, and significance of Environmental Impact Assessment (EIA).
2. Analyze the impact of developmental activities on land use, soil, and water resources.
3. Evaluate the impact of development on vegetation, wildlife, and assess environmental risks.
4. Develop environmental audit procedures and assess compliance with environmental regulations.
5. Understand and apply environmental acts, notifications, and legal frame works in EIA studies.

UNIT– 1 CONCEPTS AND METHODOLOGIES OF EIA: (9)

Initial Environmental Examination, Elements of EIA, - Factors Affecting E-I-A Impact Evaluation and Analysis, Preparation of Environmental Base Map, Classification of Environmental Parameters- Criteria for The Selection of EIA Methodology, E I A Methods, Ad-Hoc Methods, Matrix Methods, Network Method Environmental Media Quality Index Method, Overlay Methods and Cost/Benefit Analysis.

UNIT– 2 IMPACT OF DEVELOPMENTAL ACTIVITIES AND LAND USE (9)

Introduction and Methodology for The Assessment of Soil and Ground Water, Delineation of Study Area, Identification of Actives. Procurement of Relevant Soil Quality, Impact Prediction, Assessment of Impact Significance, Identification and Incorporation of Mitigation Measures. E I Ain Surface Water, Air and Biological Environment: Methodology for The Assessment of Impacts on Surface Water Environment, Air Pollution Sources, Generalized Approach for Assessment of Air Pollution Impact.

UNIT–3 ASSESSMENT OF IMPACT ON VEGETATION, WILD LIFE AND RISK ASSESSMENT (9)

Introduction - Assessment of Impact of Development Activities on Vegetation and Wildlife, Environmental Impact of Deforestation – Causes and Effects of Deforestation - Risk Assessment and Treatment of Uncertainty-Key Stages in Performing an Environmental Risk Assessment- Advantages of Environmental Risk Assessment.

UNIT– 4 ENVIRONMENTAL AUDIT (9)

Introduction - Environmental Audit &Environmental Legislation Objectives of Environmental Audit, Types of Environmental Audit, Audit Protocol, Stages of Environmental Audit, Onsite Activities, Evaluation of Audit Data and Preparation of Audit Report Report

UNIT– 5 ENVIRONMENTAL ACTS AND NOTIFICATIONS (9)

The Environmental Protection Act, The Water Preservation Act, The Air (Prevention &Control of Pollution Act), Wild Life Act - Provisions in The EIA Notification, Procedure for Environmental Clearance, Procedure for Conducting Environmental Impact Assessment Report- Evaluation of EIA Report. Environmental Legislation Objectives, Evaluation of Audit Data and Preparation of Audit Report. Post Audit Activities, Concept of ISO and ISO 14000.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	**Apply** various methodologies for conducting Environmental Impact Assessments.	**PO1,PO2,PO3,PO4, PO5,PO6**
CO2	**Analyze** the impact of land-use changes on soil, water, and air quality.	**PO1,PO2,PO3,PO4, PO5,PO6**
CO3	**Evaluate** the environmental impact on vegetation, wildlife, and conduct risk assessments.	**PO1,PO2,PO3,PO4, PO5,PO6, PO7**
CO4	**Develop** environmental audit reports and assess compliance with environmental policies.	**PO1,PO2,PO3,PO4, PO5,PO6, PO7**
CO5	**Interpret** and apply environmental acts and regulations related to EIA.	**PO1,PO2,PO3,PO4, PO5,PO6, PO7,PO8**

TEXT BOOKS:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B. S. Publication, Hyderabad 2nd edition 2011
2. Environmental Impact Assessment, by Canter Larry W., McGraw-Hill education Edi (1996)

REFRENCE BOOKS:

1. Environmental Engineering, by Peavy, H. S, Rowe, D. R, Tchobanoglous, G.Mc-Graw Hill International Editions, New York 1985.
2. Environmental Science and Engineering, by Suresh K. Dhaneja, S.K., Katania& Sons Publication, New Delhi
3. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers.
4. Environmental Pollution and Control, by H. S. Bhatia, Galgotia Publication (P) Ltd, Delhi

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/124/107/124107160/

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	3	-	-	-	-	-	-
CO2	3	3	3	2	2	3	-	-	-	-	-	-
CO3	3	3	3	2	2	3	3	-	-	-	-	-
CO4	3	3	3	3	2	3	3	-	-	-	-	-
CO5	2	2	2	2	2	3	3	3	-	-	-	-
CO*	**2.8**	**2.6**	**2.6**	**2.2**	**2**	**3**	**3**	**3**				

IV B. Tech–VII Semester

23OEC471A	**FUNDAMENTALS OF MICROPROCESSORS AND CONTROLLERS (OPEN ELECTIVE – III)**	**L T P C** **3 0 0 3**

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To comprehend the architecture, operation, and configurations of the 8086 microprocessors.
2. To get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
3. To study the interfacing of 8086 with memory, peripherals, and controllers for various applications.
4. To learn the architecture, instruction set, and programming of the 8051 microcontrollers.
5. To understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

UNIT –1: 8085 AND 8086 ARCHITECTURES: (9)

8085 Architecture, Pind diagram, Addressing modes, Instruction set, 8086 Architecture: Introduction, Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response.

UNIT –2: 8086 PROGRAMMING: (9)

8086 Programming: 8086 system timing, minimum mode and maximum mode configuration, Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT –3: 8086 INTERFACING: (9)

Introduction: Intel 8255 programmable peripheral interface, Interfacing with LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT –4: MICROCONTROLLER: (9)

Microcontroller: Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming, Comparison of Microprocessor, Microcontroller, PIC and ARM processors

UNIT –5: INTERFACING MICROCONTROLLER: (9)

Interfacing Microcontroller: Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Gain knowledge on the architecture, operation, and configurations of the 8085 and 8086 microprocessors.	**PO1**
CO2	Get familiar with 8086 programming concepts, instruction set, and assembly language development tools.	**PO1, PO2**
CO3	Know the interfacing of 8086 with peripherals, and controllers for various applications.	**PO1, PO2**
CO4	Learn the architecture, instruction set, programming of the 8051 microcontrollers and processor comparisons.	**PO1, PO2**
CO5	Understand microcontroller interfacing techniques, peripheral programming.	**PO1**

TEXT BOOKS:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.

REFERENCE BOOKS:

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning, 2004.

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/108/105/108105102/
2. https://archive.nptel.ac.in/courses/106/108/106108100/

CO-PO MAPPING:

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

IV B.Tech. - VII Semester

23OCS471A	FUNDAMENTALS OF DATABASE SYSTEMS (OPEN ELECTIVE-III)	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Introduction to Programming

COURSE EDUCATIONAL OBJECTIVES:

1. Discuss the basic Database concepts and the applications, data models and ER Model.
2. Understand the Relational database design principles
3. Master the basics of SQL and construct queries using SQL.
4. Understand the Normalization process in Database Management System,

Familiar with the basic issues of transaction processing and concurrency control.

UNIT -1: INTRODUCTION TO DATABASE MANAGEMENT SYSTEM AND ENTITY RELATIONSHIP MODEL (9)

Database system - Characteristics (Database Vs File System) - Database Users - Advantages of Database systems - Database applications - Brief introduction of different Data Models - Concepts of Schema - Instance and data independence - Three tier schema architecture for data independence - Database system structure environment - Centralized and Client Server architecture for the database - Introduction to Entity Relationship Model - Representation of entities - Attributes - Entity set - Relationship - Relationship set - Constraints - Sub classes - super class - Inheritance-Specialization - Generalization using ER Diagrams.

UNIT -2: RELATIONAL MODEL (9)

Introduction to Relational model - Concepts of domain - Attribute - Tuple - Relation importance of null values - Constraints (Domain, Key constraints, integrity constraints) and their importance - Relational Algebra, Relational Calculus - BASIC SQL: Simple Database schema - Data Base Language - types- Table definitions (create, alter), different DML operations (insert, delete, update).

UNIT -3: INTRODUCTION TO STRUCTURED QUERY LANGUAGE (9)

Basic SQL querying (select and project) using where clause arithmetic & logical operations - SQL functions(Date and Time, Numeric, String conversion) - Creating tables with relationship, Implementation of key and integrity constraints - Nested queries, sub queries, grouping, aggregation, ordering - Implementation of different types of Joins, view (updatable and non-updatable) - Relational set operations.

UNIT -4: NORMALIZATION (9)

Purpose of Normalization and schema refinement - Concept of functional dependency - normal forms based on functional dependency - Lossless join and dependency preserving decomposition (1NF, 2NF and 3 NF), concept of surrogate key - Boyce-Codd normal form(BCNF) - MVD - Fourth normal form(4NF) - Fifth Normal Form (5NF).

UNIT -5: TRANSACTION CONCEPT AND INDEXING CONCEPTS (9)

Transaction State - ACID properties - Concurrent Executions - Serializability - Recoverability, Implementation of Isolation - Testing for Serializability - Lock based - Time stamp based optimistic- Concurrency protocols - Deadlocks - Failure Classification - Storage, Recovery and Atomicity - Recovery algorithm - Introduction to Indexing Techniques - B+ Trees, operations on B+Trees - Hash Based Indexing

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Demonstrate knowledge on Data models and Database Languages and Design Entity Relationship model for a database	**PO1, PO3**
CO2	Analyze the relational database theory, and be able to write relational algebra and relational calculus expressions for queries	**PO1, PO2**
CO3	Analyze and evaluate the database using SQL DML/DDL	**PO1, PO2, PO3, PO5**
CO4	Analyze databases using normal forms to provide solutions for real time applications	**PO1, PO2**
CO5	Understand the properties of transactions in a database system, analyze serializability and indexing techniques	**PO1, PO3, PO4**

TEXT BOOKS:

1. Database Management Systems, 3rd edition, Raghu rama Krishnan, Johannes Gehrke, TMH (For Chapters 2, 3, 4)
2. Database System Concepts, 5th edition, Silber schatz, Korth, Sudarsan, TMH (For Chapter 1 and Chapter 5)

REFERENCE BOOKS:

1. Introduction to Database Systems, 8th edition, C J Date, Pearson.
2. Database Management System, 6th edition, Ramez Elmasri, Sham kant B, Navathe, Pearson
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning

REFERENCE WEBSITES:

1. https://www.w3schools.in/sql/database-concepts
2. https://www.javatpoint.com/dbms-tutorial
3. https://nptel.ac.in/courses/106/105/106105175/
4. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0127580666728202246_shared/overview

CO-PO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	3	-	-	-	-	-	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	-
CO5	3	-	2	3	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2.5**	**2.5**	**3**							

IV B.Tech. - VII Semester

23OCS471B	**FUNDAMENTALS OF CYBER SECURITY (OPEN ELECTIVE – III)**	**L T P C** **3 0 0 3**

PRE-REQUISITES: Computer Networks

COURSE EDUCATIONAL OBJECTIVES:

1. Classify the cybercrimes and understand the Indian ITA 2000
2. Analyze the vulnerabilities in any computing system and find the solutions
3. Predict the security threats of the future
4. Investigate the protection mechanisms
5. Design security solutions for organizations

UNIT – 1: INTRODUCTION TO CYBERCRIME (9)

Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, and Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes

UNIT – 2: CYBER OFFENSES: HOW CRIMINALS PLAN THEM (9)

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

UNIT – 3: CYBERCRIME: MOBILE AND WIRELESS DEVICES (9)

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

UNIT – 4: TOOLS AND METHODS USED IN CYBERCRIME (9)

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT – 5: CYBER SECURITY: ORGANIZATIONAL IMPLICATIONS (9)

Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand the concepts of cybercrime and information security.	**PO1, PO2, PO3, PO4**
CO2	Understand how cybercriminals plan and execute attacks.	**PO1, PO2, PO3, PO4**
CO3	Analyze frauds in mobile and wireless computing environments.	**PO1, PO2, PO3, PO4**
CO4	Analyze DoS/DDoS attacks, SQL injection, and buffer overflow attacks.	**PO1, PO2, PO3, PO4**
CO5	Analyze security risks associated with social media marketing.	**PO1, PO2, PO3, PO4**

TEXT BOOKS:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina

REFERENCE BOOKS:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Olson, CRC Press
2. Introduction to Cyber Security, Chwan- Hwa (John) Wu, J. David Irwin, CRC Press

.

REFERENCE WEBSITES:

1. http://nptel.ac.in/courses/106105031/40
2. http://nptel.ac.in/courses/106105031/39
3. http://nptel.ac.in/courses/106105031/38

CO-PO MAPPING:

CO/ PO	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	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

IV B.Tech. - VII Semester

23OME471A	**3D PRINTING TECHNOLOGIES (OPEN ELECTIVE – III)**	**L T P C** **3 0 0 3**

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. Understand the fundamental concepts of prototyping and distinguish between traditional and rapid prototyping methods.
2. Demonstrate the working principles, materials, and applications of solid-, liquid-, and powder-based RP systems.
3. Define the processes and classifications of rapid tooling and reverse engineering techniques.
4. Identify common errors in 3D printing and evaluate pre-processing, processing, and post-processing issues.
5. Familiarize RP-related software and its role in applications such as design, manufacturing, and medical fields.

UNIT –1: INTRODUCTION TO 3D PRINTING: (9)

Introduction to 3D Printing Introduction to Prototyping, Traditional Prototyping Vs. Rapid Prototyping (RP), Need for time compression in product development, Usage of RP parts, Generic RP process, Distinction between RP and CNC, other related technologies, Classification of RP.

UNIT –2: SOLID AND LIQUID BASED RP SYSTEM: (9)

Working Principle, Materials, Advantages, Limitations and Applications of Fusion Deposition Modelling (FDM), Laminated Object Manufacturing (LOM), Stereo lithography (SLA), Direct Light Projection System (DLP) and Solid Ground Curing (SGC).

UNIT –3: POWDER BASED & OTHER RP SYSTEMS: (9)

Powder Based RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Selective Laser Sintering (SLS), Direct Metal Laser Sintering (DMLS), Laser Engineered Net Shaping(LENS) and Electron Beam Melting (EBM).

Other RP Systems: Working Principle, Materials, Advantages, Limitations and Applications of Three Dimensional Printing (3DP), Ballastic Particle Manufacturing (BPM) and Shape Deposition Manufacturing (SDM)

UNIT –4: RAPID TOOLING & REVERSE ENGINEERING RAPID TOOLING: (9)

Rapid Tooling & Reverse Engineering Rapid Tooling: Conventional Tooling Vs. Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods. Reverse Engineering (RE): Meaning, Use, RE – The Generic Process, Phases of RE Scanning, Contact Scanners and Noncontact Scanners, Point Processing, Application Geometric Model, Development.

UNIT –5: ERRORS IN 3D PRINTING AND APPLICATIONS: (9)

Pre-processing, processing and post-processing errors, Part building errors in SLA, SLS, etc. Software: Need for software, MIMICS, Magics, Surgi Guide, 3-matic, 3D-Doctor, Simplant, Velocity2, VoXim, Solid View,3DView, etc., software, Preparation of CAD models, Problems with STL files, STL file manipulation, RP data formats: SLC, CLI, RPI, LEAF, IGES, HP/GL, CT, STEP. Applications: Design, Engineering Analysis and planning applications, Rapid Tooling, Reverse Engineering, Medical Applications of RP.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Define and explain the evolution and need for rapid prototyping in modern product development.	**PO1, PO2, PO3, PO4**
CO2	Compare and contrast various 3D printing technologies based on working principles, materials, and limitations.	**PO1, PO2, PO3, PO4**
CO3	Apply knowledge of rapid tooling and reverse engineering techniques for industrial and design applications.	**PO1, PO2, PO3, PO4**
CO4	Diagnose and interpret different types of errors encountered in 3D printing processes and recommend solutions.	**PO1, PO2, PO3, PO4**
CO5	Use RP-specific software tools to manipulate STL files and prepare models for printing in real-world scenarios	**PO1, PO2, PO3, PO4**

TEXT BOOKS:

1. Chee Kai Chua and Kah Fai Leong, ―3D Printing and Additive Manufacturing Principles and Applications‖ 5/e, World Scientific Publications, 2017.
2. Ian Gibson, David W Rosen, Brent Stucker, ―Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing‖, Springer, 2/e, 2010. Reference Books:

REFERENCE BOOKS:

1. Frank W.Liou, ―Rapid Prototyping & Engineering Applications‖, CRC Press, Taylor & Francis Group, 2011.
2. Rafiq Noorani, ―Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons, 2006.

CO-PO MAPPING:

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

IV B Tech- VII Semester

		L	T	P	C
23OSH471A	**WAVELET TRANSFORMS AND ITS APPLICATIONS (OPEN ELECTIVE-III)**	**3**	**-**	**-**	**3**

PRE-REQUISITES: Digital Signal Processing

COURSE EDUCATIONAL OBJECTIVES:

1. To impart knowledge on basics of wavelet Transform and its analysis.
2. To understand the methods of Discrete Wavelet Transformation & its expansion.
3. To learn the Filtering and Down-Sampling for approximation.
4. To interpret and analyze Periodic Vs Non periodic Discrete Wavelet Transforms.
5. To introduce the concepts of Frames and Tight Frames.

UNIT–1: WAVELETS (9)

Wavelets and Wavelet Expansion Systems - Wavelet Expansion-Wavelet Transform-Wavelet System – More Specific Characteristics of Wavelet Systems - Haar Scaling Functions and Wavelets - effectiveness of Wavelet Analysis -The Discrete Wavelet Transform - The Discrete-Time and Continuous Wavelet Transforms.

UNIT–2: A MULTI RESOLUTION FORMULATION OF WAVELET SYSTEMS (9)

Signal Spaces -The Scaling Function -Multiresolution Analysis -The Wavelet Functions - The Discrete Wavelet Transform- A Parseval's Theorem - Display of the Discrete Wavelet Transform and the Wavelet Expansion.

UNIT–3: FILTER BANKS AND THE DISCRETE WAVELET TRANSFORM (9)

Analysis - From Fine Scale to Coarse Scale- Filtering and Down-Sampling or Decimating - Synthesis - From Coarse Scale to Fine Scale -Filtering and Up-Sampling or Stretching - Input Coefficients -Lattices and Lifting - -Different Points of View.

UNIT–4: TIME – FREQUENCY AND COMPLEXITY (9)

Multi resolution versus Time - Frequency Analysis- Periodic versus Non periodic Discrete Wavelet Transforms -The Discrete Wavelet Transform versus the Discrete-Time Wavelet Transform- Numerical Complexity of the Discrete Wavelet Transform.

UNIT-5: BASES AND MATRIX EXAMPLES (9)

Bases, Orthogonal Bases, and Bi orthogonal Bases -Matrix Examples - Fourier Series Example - Sine Expansion Example - Frames and Tight Frames.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand wavelets and wavelet basis and characterize continuous and discrete wavelet transforms	**PO1,PO2,PO3, PO4,PO12**
CO2	Illustrate the multi resolution analysis and scaling functions	**PO1,PO2,PO3, PO4,PO12**
CO3	Implement discrete wavelet transforms with multi rate digital filters	**PO1,PO2,PO3, PO4,PO12**
CO4	Understand multi resolution analysis and identify various wavelets and evaluate their time-frequency resolution properties.	**PO1,PO2,PO3, PO4,PO12**
CO5	Design certain classes of wavelets to specification and justify the basis of the application of Wavelet transforms to different fields	**PO1,PO2,PO3, PO4,PO12**

TEXT BOOKS:

1. C. Sidney Burrus, Ramesh A. Gopinath, ― Introduction to Wavelets and Wavelets Transforms ‖, Prentice Hall, (1997).
2. James S.Walker, ― A Primer on Wavelets and their Scientific Applications ‖,CRC Press, (1999).

REFERENCE BOOKS:

1. Raghuveer Rao,―Wavelet Transforms ‖,Pearson Education, Asia
2. C.S.Burrus, Ramose and A.Gopinath, Introduction to Wavelets and Wavelet Transform, Prentice Hall Inc.

REFERENCE WEBSITE:

1. http://users.rowan.edu/~polikar/WAVELETS/WTtutorial.html
2. http://www.wavelet.org/
3. http://www.math.hawaii.edu/~dave/Web/Amara's%20Wavelet%20Page.htm
4. https://jqichina.wordpress.com/wp-content/uploads/2012/02/ten-lectures-

CO-PO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	-	-	-	1
CO2	3	2	2	2	-	-	-	-	-	-	-	1
CO3	3	2	2	1	-	-	-	-	-	-	-	1
CO4	2	2	2	1	-	-	-	-	-	-	-	1
CO5	3	3	2	1	-	-	-	-	-	-	-	1
CO*	**2.8**	**2.4**	**2**	**1.4**								**1**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
(AUTONOMOUS)
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
NBA ACCREDITED

IV B.Tech. - VII Semester

23OSH471B	SMART MATERIALS AND DEVICES (OPEN ELECTIVE-III)	L T P C 3 0 0 3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the principles and applications of smart materials in engineering.
2. To understand the science behind smart materials and their behavior.
3. To elucidate the responsive characteristics of smart materials
4. To explore synthesis and characterization techniques for smart materials
5. To determine the appropriate smart material for a given application.

UNIT 1 INTRODUCTION TO SMART MATERIALS (9)

Historical account of the discovery and development of smart materials, Shape memory materials, chromoactive materials, magneto rheological materials, photoactive materials, Polymers and polymer composites (Basics).

UNIT 2 PROPERTIES OF SMART MATERIALS (9)

Optical, Electrical, Dielectric, Piezoelectric, Ferroelectric, Pyroelectric and Magnetic properties of smart materials.

UNIT 3 SYNTHESIS OF SMART MATERIALS (9)

Chemical route: Chemical vapour deposition, Sol-gel technique, hydrothermal method, Mechanical alloying and thin film deposition techniques: Chemical etching, Spray pyrolysis.

UNIT 4 CHARACTERIZATION TECHNIQUES (9)

Powder X-ray diffraction, Raman spectroscopy (RS), UV-Visible spectroscopy, Scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Atomic force microscopy (AFM).

UNIT 5 SMART MATERIALS BASED DEVICES (9)

Devices based on smart materials: Shape memory alloys in robotic hands, piezoelectric based devices, MEMS and intelligent devices.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Describe the breakthroughs that transformed shape memory materials into practical applications. Describe the two phases in shape memory alloys.	PO1, PO2,PO3,PO4,PO5
CO2	Investigate how smart materials react to external influences like light, electricity, and heat.	PO1, PO2,PO3,PO4,PO5
CO3	Describe synthesis approaches for smart materials.	PO1, PO2,PO3,PO4,PO5
CO4	Overview of characterization techniques for understanding smart material behavior.	PO1, PO2,PO3,PO4, PO5
CO5	Highlight the advantages of using smart materials in device applications.	PO1, PO2,PO3,PO4

TEXT BOOKS:

1. Yaser Dahman, Nano technology and Functional Materials for Engineers-,Elsevier, 2017
2. E. Zschech,C. Whelan, T. Mikolajick, Materials for Information Technology: Devices, Interconnects and Packaging Springer-Verlag London Limited 2005.

REFERENCE BOOKS:

1. Gauenzi,P.,SmartStructures,Wiley,2009.
2. Mahmood Ali of khazraei, Hand book of functional nano materials, Vol(1&2), Nova Publishers, 2014
3. Hand book of Smart Materials, Technologies, and Devices: Applications of Industry, 4.0, Chaudhery Mustansar Hussain, Paolo DiSia, Springer, 2022.
4. Fundamentals of Smart Materials, Mohsen Shahinpoor, Royal Society of Chemistry, 2020.

REFERENCE WEBSITE:

1. https://onlinecourses.nptel.ac.in/noc22_me17/preview

CO-PO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-
CO3	3	3	1	1	1	-	-	-	-	-	-	-
CO4	3	2	1	1	1	-	-	-	-	-	-	-
CO5	3	3	1	1	-	-	-	-	-	-	-	-
CO*	**3**	**2.4**	**1.4**	**1.2**	**1**							

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES.
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NBA ACCREDITED
IV B.Tech VII-Semester

23OSH471C	**INTRODUCTION TO QUANTUM MECHANICS (OPEN ELECTIVE – III)**	**L T P C** **3 0 0 3**

PRE-REQUISITES: Introduction to Quantum Techniques

COURSE EDUCATIONAL OBJECTIVES:

1. To comprehend the fundamental distinctions between classical and quantum mechanics.
2. To analyze the concepts of wave-particle duality and the uncertainty principle, along with their physical implications.
3. To acquire knowledge and solve the Schrödinger equation for simple quantum systems.
4. To apply operator formalism and relevant mathematical techniques in the study of quantum mechanics.
5. To investigate the quantum mechanical representations of angular momentum and spin.

UNIT- 1: PRINCIPLES OF QUANTUM MECHANICS (9)

Introduction: Limitations of classical Mechanics, Difficulties with classical theories of black body radiation and origin of quantum theory of radiation. Wave-particle duality: de Broglie wavelength, Heisenberg uncertainty principle. Schrödinger time independent and time dependent wave equation, Solution of the time dependent Schrödinger equation, Concept of stationary states, Physical significance of wave function (ψ), Orthogonal, Normalized and Orthonormal functions

UNIT- 2: ONE-DIMENSIONAL PROBLEMS AND SOLUTIONS (9)

Potential step – Reflection and Transmission at the interface. Potential well: Square well potential with rigid walls, Square well potential with finite walls. Potential barrier: Penetration of a potential barrier (tunneling effect). Periodic potential and Harmonic oscillator, Energy eigen functions and eigen values.

UNIT-3: OPERATOR FORMALISM (9)

Operators, Operator Algebra, Eigen values and Eigen vectors, Postulates of quantum mechanics, Matrix representation of wave functions and linear operators.

UNIT- 4: MATHEMATICAL TOOLS FOR QUANTUM MECHANICS (9)

The concept of row and column matrices, Matrix algebra, Hermitian operators – definition. Dirac's bra and ket notation, Expectation values, Heisenberg (operator) representation of harmonic oscillator, Ladder operators and their significance.

UNIT- 5: ANGULAR MOMENTUM AND SPIN (9)

Angular momentum operators: Definition. Eigen functions and Eigen values of AM operators. Matrix representation of angular momentum operators, System with spin half (1/2), Spin angular momentum, Pauli's spin matrices. Clebsch-Gordon coefficients. Rigid Rotator: Eigen functions and Eigen values.

TOTAL HOURS: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Explain the foundational principles of quantum mechanics	**PO1,PO2,PO3,PO4,PO5**
CO2	Apply Schrödinger equations to solve one-dimensional quantum problems	**PO1,PO2,PO3,PO4,PO5**
CO3	Solve quantum mechanical problems using operator and matrix formulations,	**PO1,PO2,PO3,PO4,PO5**
CO4	Evaluate quantum states using Dirac notation and expectation values.	**PO1,PO2,PO3,PO4,PO5**
CO5	Analyze angular momentum and spin systems using Pauli matrices and operators.	**PO1,PO2,PO3,PO4,PO5**

TEXT BOOKS:

1. Quantum Mechanics. Vol 1, A. MessaiaNoth-Holland Pub. Co., Amsterdam,(1961).
2. A Text Book of Quantum Mechanics. P.M.Mathews and K.Venkatesam, Tata McGraw Hill, New Delhi,(1976).
3. Introduction to Quantum Mechanics. R.H.Dicke and J.P.Witke, Addison-Wisley Pub.Co.Inc., London, (1960).
4. Quantum Mechanics. S.L.Gupta, V.Kumar, H.V.Sarama and R.C.Sharma, Jai PrakashNath& Co, Meerut, (1996).

REFERENCE BOOKS:

1. Quantum Mechanics. L.I. Schiff, McGraw Hill Book Co., Tokyo, (1968).
2. Introduction to Quantum Mechanics. Richard L. Liboff, Pearson Education Ltd (Fourth Edn.) 2003.

REFERENCE WEBSITE:
1. https://archive.nptel.ac.in/courses/115/101/115101107/
2. https://archive.nptel.ac.in/courses/122/106/122106034/
3. https://nptel.ac.in/courses/115106066.

CO-PO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	-	-	-	-	-	-	-
CO2	3	2	2	1	1	-	-	-	-	-	-	-
CO3	3	3	2	1	1	-	-	-	-	-	-	-
CO4	3	3	3	2	3	-	-	-	-	-	-	-
CO5	3	3	1	1	1	-	-	-	-	-	-	-
CO*	**3**	**2.8**	**2**	**1.4**	**1.6**							

IV B Tech- VII Semester

23OSH471D	GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT (OPEN ELECTIVE-III)	L T P C
		3 0 0 3

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To Understand Principle and Concepts of Green Chemistry.
2. To Understand the Types of Catalysis and Industrial Applications.
3. To Apply Green Solvents in Chemical Synthesis.
4. To Enumerate Different Sourced of Green Energy.
5. To Apply Alternative Greener Methods Foe Chemical Reactions

UNIT I: PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY (9)

Introduction, Green chemistry Principles, sustainable development and green chemistry, E factor, atom economy, atom economic Reactions: Rearrangement and addition reactions and atom un- economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation, Polymer recycling

UNIT 2: CATALYSIS AND GREEN CHEMISTRY (9)

Introduction, Types of catalysis, Heterogeneous catalysis: Basics of Heterogeneous Catalysis, Zeolite and the Bulk Chemical Industry, Heterogeneous Catalysis in the Fine Chemical and Pharmaceutical Industries, Catalytic Converters, Homogeneous catalysis: Transition Metal Catalysts with Phosphine Ligands, Greener Lewis Acids, and Phase transfer catalysis, Bio-catalysis and Photo- catalysis with examples.

UNIT 3: GREEN SOLVENTS IN CHEMICAL SYNTHESIS (9)

Green Solvents: Concept, Tools and techniques for solvent selection, supercritical fluids: Super critical carbon dioxide, super critical water, Polyethylene glycol (PEG), Ionic liquids, Recycling of green solvents.

UNIT 4: EMERGING GREENER TECHNOLOGIES (9)

Biomass as renewable resource, Energy: Energy from Biomass, Solar Power, Chemicals from Renewable Feedstock's, Chemicals from Fatty Acids, Polymers from Renewable Resources, Alternative Economies: The Syngas Economy, The Biorefinery, Design for energy efficiency, Mechanochemical synthesis.

UNIT 5: ALTERNATIVE GREENER METHODS (9)

Photochemical Reactions - Examples, Advantages and Challenges, Photo redox catalysis, single electron transfer reactions (SET), Examples of Photochemical Reactions, Microwave-assisted Reactions and Sono chemical reactions, examples and applications.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Apply the Green chemistry Principles for day-to-day life as well as synthesis, describe the sustainable development and green chemistry, explain economic and un-economic reactions, Demonstrate Polymer recycling.	**PO1,PO2,PO3, PO4, PO5, PO7**
CO2	Explain Heterogeneous catalyst and its applications in Chemical and Pharmaceutical Industries, Differentiate Homogeneous and Heterogeneous catalysis, Identify the importance of Bio and Photo Catalysis, Discuss Transition metal and Phase transfer Catalysis	**PO1,PO2,PO3, PO4, PO5, PO7**
CO3	Demonstrate Green solvents and importance, Discuss Supercritical carbon dioxide, Explain Supercritical water, recycling of green solvents.	**PO1,PO2,PO3, PO4, PO5, PO7**
CO4	Describe importance of Biomass and Solar Power, Illustrate Sono chemistry, Apply Green Chemistry for Sustainable Development; discuss the importance of Renewable resources, mechanochemical synthesis.	**PO1,PO2,PO3, PO4, PO5, PO7**
CO5	Discuss Alternative green methods like Photo redox catalysis, single electron transfer reactions (SET), Photochemical Reactions, Microwave-assisted Reactions and Sono chemical reactions, examples and applications.	**PO1,PO2,PO3, PO4, PO5, PO7**

TEXT BOOKS:

1. M. Lancaster, Green Chemistry an Introductory Text, Royal Society of Chemistry, 2002.
2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, Usa

REFERENCE BOOKS:

1. Green Chemistry for Environmental Sustainability, First Edition, Sanjay K. Sharma and Ackmez Mudhoo, CRC Press, 2010.
2. Edited by Alvise Perosa and Maurizio Selva, Hand Book of Green chemistry Volume 8: Green Nanoscience, wiley-VCH, 2013.

CO-PO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	1	-	2	-	-	-	-	-
CO2	2	3	2	2	2	-	1	-	-	-	-	-
CO3	2	2	3	1	2	-	1	-	-	-	-	-
CO4	3	3	2	2	2	-	2	-	-	-	-	-
CO5	2	2	3	1	1	-	1	-	-	-	-	-
CO*	**3**	**2.8**	**2**	**1.4**	**1.6**		**1.4**					

IV B Tech- VII Semester

		L	T	P	C
23OSH471E	**EMPLOYABILITY SKILLS (Open Elective-III)**	**3**	**0**	**0**	**3**

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To encourage all round development of the students by focusing on productive skills
2. To make the students aware of Goal setting and writing skills
3. To enable them to know the importance of presentations skills in achieving desired goals.
4. To help them develop organizational skills group activities.
5. To function effectively with heterogeneous teams

UNIT-1 GOAL SETTING AND SELF-MANAGEMENT (9)

Definition, importance, types of Goal Setting– SMART Goal Setting– Advantages–Motivation– Intrinsic and Extrinsic Motivation–Self-Management-Knowing about self–SWOC Analysis

UNIT-2 WRITING SKILLS (9)

Definition, significance, types of writing skills –Resume writing Vs CV Writing - E-Mail writing, Cover Letters- E-Mail Etiquette –So P (Statement of Purpose)

UNIT-3 TECHNICAL PRESENTATION SKILLS (9)

Nature, meaning& significance of Presentation Skills– Planning, Preparation, Presentation, Stage Dynamics –Anxiety in Public speaking (Glossophobia)- PPT & Poster Presentation

UNIT-4 GROUP PRESENTATION SKILLS (9)

Body Language – Group Behavior–Team Dynamics –Leadership Skills –Personality Manifestation -Group Discussion-Debate –Corporate Etiquette

UNIT-5 JOB CRACKING SKILLS (9)

Nature, characteristics, importance &types of Interviews –Job Interviews–Skills for success–Job Searching skills – STAR method - FAQs-Answering Strategies–Mock Interviews.

Total Hours: 45

Course Outcomes:

On successful completion of the course, students will be able to		**POs**
CO1	Understand the importance of goals and try to achieve them	**PO1,PO2,PO3,PO4,PO5, PO12**
CO2	Explain the significance of self-management	**PO1,PO2,PO3,PO4,PO5, PO12**
CO3	Apply the knowledge of writing skills in preparing eye-catchy resumes	**PO1,PO2,PO3,PO4,PO5, PO6,PO12**
CO4	Analyze various forms of Presentation skills	**PO1,PO2,PO3,PO4,PO5, PO12**
CO5	Judge the group behavior appropriately Develop skills required for employability.	**PO1,PO2,PO3,PO4,PO5, PO12**

TEXT BOOKS:

1. Sabina Pillai, Agna Fernandez. Soft Skills & Employability Skills, 2014. Cambridge Publisher.
2. Alka Wadkar, LifeSkills for Success, Sage Publications, 2016.

REFERENCE BOOKS:

1. Gangadhar Joshi, Campus to Corporate Paper back, Sage Publications, 2015.
2. Sherfield Montogomery Moody, Corner stone Developing Soft Skills, Pearson Publications, 4EdN, 2008
3. Shikha Kapoor, Personality Development and Soft Skills-Preparing for Tomorrow, 1^{st} Edn, Wiley, 2017.
4. M.SenGupta, Skills for Employability, Innovative Publication,2019.
5. Steve Duck and David TMcMahan, The Basic of Communication Skills A Relational Perspective, Sage press, 2012.

REFERENCE WEBSITE:

1. https://youtu.be/gkLsn4ddmTs
2. https://youtu.be/2bf9K2rRWwo
3. https://youtu.be/FchfE3c2jzc
4. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7KIJ
5. https://www.youtube.com/c/skillopedia/videos
6. https://onlinecourses.nptel.ac.in/noc25_hs96/preview
7. https://onlinecourses.nptel.ac.in/noc21_hs76/preview
8. https://archive.nptel.ac.in/courses/109/107/109107172/#
9. https://archive.nptel.ac.in/courses/109/104/109104107/

CO-PO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	1
CO2	3	3	2	3	2	-	-	-	-	-	-	2
CO3	3	3	3	3	2	1	-	-	-	-	-	2
CO4	3	3	2	2	1	-	-	-	-	-	-	1
CO5	3	3	3	3	2	-	-	-	-	-	-	2
CO*	3	3	2	2.6	1.6	1						1.6

IV B. Tech–VII Semester

230CE472A	**GEO-SPATIAL TECHNOLOGIES (OPEN ELECTIVE-IV)**	**L T P C** **3 0 0 3**

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To understand raster-based spatial analysis techniques, including query, overlay, and cost-distance analysis.
2. To analyze vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.
3. To apply network analysis techniques for geocoding, shortest path analysis, and location-allocation problems.
4. To evaluate surface and geo-statistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.
5. To assess GIS customization, Web GIS, and mobile mapping techniques for real world applications.

UNIT– 1 RASTER ANALYSIS (9)

Raster Data Exploration: Query Analysis - Local Operations: Map Algebra, Reclassification, Logical and Arithmetic Overlay Operations—Neighborhood - Operations: Aggregation, Filtering – Extended Neighborhood-Operations- Zonal Operations - Statistical Analysis – Cost-Distance Analysis-Least Cost Path.

UNIT– 2 VECTOR ANALYSIS (9)

Non-Topological Analysis: Attribute Database Query, Structured Query Language, Co Ordinate Transformation, Summary Statistics, Calculation of Area, Perimeter and Distance – topological Analysis: Reclassification, Aggregation, Overlay Analysis: Point-In-Polygon, Line-In-Polygon, Polygon-On-Polygon: Clip, Erase, Identity, Union, Intersection – Proximity Analysis: Buffering

UNIT– 3 NETWORK ANALYSIS (9)

Network – Introduction - Network Data Model – Elements of Network - Building A Network Database - Geocoding – Address Matching - Shortest Path in A Network – Time and Distance Based Shortest Path Analysis – Driving Directions – Closest Facility Analysis – Catchment / Service Area Analysis-Location-Allocation Analysis

UNIT– 4 SURFACE and GEOSTATISTICAL ANALYSIS (9)

Surface Data – Sources of X, Y, Z Data – DEM, TIN – Terrain Analysis – Slope, Aspect, Viewshed, Watershed Analysis: Watershed Boundary, Flow Direction, Flow Accumulation, Drainage Network, Spatial Interpolation: IDW, Spline, Kriging, Variogram.

UNIT– 5 CUSTOMISATION, WEBGIS, MOBILEMAPPING (9)

Customization of GIS: Need, Uses, Scripting Languages –Embedded Scripts – Use of Python Script - Web GIS: Web GIS Architecture, Advantages of Web GIS, Web Applications- Location Based Services: Emergency and Business Solutions - Big Data Analytics.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand raster-based spatial analysis techniques, including query, overlay, and cost- distance analysis.	**PO1,PO2,PO3,PO4, PO5, PO6,PO12**
CO2	Analyze vector-based spatial analysis techniques such as topology, overlay, and proximity analysis.	**PO1,PO2,PO3,PO4, PO5,PO6,PO12**
CO3	Apply network analysis techniques for geocoding, shortest path analysis, and location- allocation problems.	**PO1,PO2,PO3,PO4, PO5,PO6, PO7, PO12**
CO4	Evaluate surface and geo-statistical analysis methods, including terrain modeling, watershed analysis, and spatial interpolation.	**PO1,PO2,PO3,PO4, PO5,PO6, PO7, PO12**
CO5	Assess GIS customization, Web GIS, and mobile mapping techniques for real-world applications.	**PO1,PO2,PO3,PO4, PO5,PO6, PO7, PO8, PO12**

TEXT BOOKS:

1. Kang – Tsung Chang, Introduction to Geographical Information System, 4th Ed., Tata McGraw Hill Edition, 2008.
2. Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems Prentice Hall, 2002.

REFRENCE BOOKS:

1. Michael N. Demers, Fundamentals of Geographic Information Systems, Wiley,2009
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasaraju, —An Introduction to Geographical Information Systems, Pearson Education, 2nd Edition, 2007.
3. John Peter Wilson, The Handbook of Geographic Information Science, Blackwell Pub.,2008

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/105/105/105105202/
2. https://onlinecourses.nptel.ac.in/noc19_cs76/preview

CO-PO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	3	-	-	-	-	-	1
CO2	3	3	3	2	2	3	-	-	-	-	-	1
CO3	3	3	3	2	2	3	3	-	-	-	-	1
CO4	3	3	3	3	2	3	3	-	-	-	-	1
CO5	2	2	2	2	2	3	3	3	-	-	-	1
CO*	2.8	2.6	2.6	2.2	2	3	3	3				1

IV B. Tech–VII Semester

230CE472B	**SOLID WASTE MANAGEMENT (OPEN ELECTIVE-IV)**	**L T P C** **3 0 0 3**

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES

1. To understand the types, sources, and characteristics of solid waste, along with
2. regulatory frameworks.
3. To analyze engineering systems for solid waste collection, storage, and transportation.
4. To apply resource and energy recovery techniques for sustainable solid waste management.
5. To evaluate landfill design, construction, and environmental impact mitigation strategies. Analyze the Hazardous Waste Management concepts.

UNIT– 1 **(9)**

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– 2 **(9)**

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– 3 **(9)**

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– 4 **(9)**

Landfills: Evolution of Landfills – Types and Construction of Landfills – Design Considerations – Life of Landfills- Landfill Problems – Lining of Landfills – Types of Liners – Leachate Pollution and Control – Monitoring Landfills – Landfills Reclamation.

UNIT– 5 **(9)**

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

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand the types, sources, and characteristics of solid waste, along with regulatory frameworks.	PO1, PO5,PO7
CO2	Analyze engineering systems for solid waste collection, storage, and transportation.	PO1,PO2,PO5,PO7, PO12
CO3	Apply resource and energy recovery techniques for sustainable solid waste management.	PO1,PO3,PO4,PO5, PO7
CO4	Evaluate landfill design, construction, and environmental impact mitigation strategies.	PO3,PO4,PO5,PO7, PO8
CO5	Assess hazardous waste management techniques, including biomedical and e-waste	PO5,PO6, PO7,PO8

TEXT BOOKS:

1. chobanoglous G, Theisen H and Vigil SA ‗Integrated Solid Waste Management, Engineering Principles and Management Issues 'McGraw-Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, ‗Solid Waste Engineering 'Brooks/Cole Thomson Learning Inc., 2002.

REFRENCE 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 Design and Construction 'Prentice Hall, 2002.

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/105/103/105103205/
2. https://archive.nptel.ac.in/courses/120/108/120108005/

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	2	-	2	-	-	-	-	-
CO2	3	3	-	-	2	-	3	-	-	-	-	2
CO3	3	-	3	2	3	-	3	-	-	-	-	-
CO4	-	-	3	3	3	-	3	2	-	-	-	-
CO5	-	-	-	-	3	3	3	3	-	-	-	-
CO*	3	3	3	2.5	2.6	3	2.8	2.5				2

IV B. Tech–VII Semester

230CE472A	TRANSDUCERS AND SENSORS (OPEN ELECTIVE-IV)	L T P C
		3 0 0 3

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To understand characteristics of Instrumentation System and the operating principle of motion transducers.
2. To explore working principles, and applications of different temperature transducers and Piezo-electric sensors.
3. To provide knowledge on flow transducers and their applications.
4. To study the working principles of pressure transducers.
5. To introduce working principle and applications of force and sound transducers.

UNIT– 1 INTRODUCTION (9)

Introduction: General Configuration and Functional Description of measuring instruments, Static and Dynamic Characteristics of Instrumentation System, Errors in Instrumentation System, Active and Passive Transducers and their Classification. Motion Transducers: Resistive strain gauge, LVDT, RVDT, Capacitive transducers, Piezo-electric transducers, seismic displacement pick-ups, vibrometers and accelerometers.

UNIT– 2 TEMPERATURE TRANSDUCERS (9)

Temperature Transducers: Standards and calibration, fluid expansion and metal expansion type transducers - bimetallic strip, Thermometer, Thermistor, RTD, Thermocouple and their characteristics. Hall effect transducers, Digital transducers, Proximity devices, Bio-sensors, Smart sensors, Piezoelectric sensors.

UNIT– 3 FLOW TRANSDUCERS (9)

Flow Transducers: Bernoulli's principle and continuity, Orifice plate, Nozzle plate, Venture tube, Rotameter, Anemometers, Electromagnetic flow meter, Impeller meter and Turbid flow.

UNIT– 4 PRESSURE TRANSDUCERS (9)

Pressure Transducers: Standards and calibration, different types of manometers, elastic transducers, diaphragm bellows, bourdon tube, capacitive and resistive pressure transducers, high- and low-pressure measurement.

UNIT– 5 FORCE AND SOUND TRANSDUCERS (9)

Force and Sound Transducers: Proving ring, hydraulic and pneumatic load cell, dynamometer and gyroscopes. Sound level meter, sound characteristics, Microphone.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand characteristics of Instrumentation System and the operating principle of motion transducers	**PO1, PO2**
CO2	Explore working principles, and applications of different temperature transducers and Piezo-electric sensors	**PO1, PO2**
CO3	Gain knowledge on flow transducers and their applications.	**PO1, PO2**
CO4	Learn the working principles of pressure transducers.	**PO1, PO2**
CO5	Understand the working principle and applications of force and sound transducers.	**PO1, PO2**

TEXT BOOKS:

1. A.K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai & Co. 3rd edition Delhi, 2010.
2. Rangan C.S, Sarma G.R and Mani V S V, "Instrumentation Devices and Systems", TATA McGraw Hill publications, 2007.

REFRENCE BOOKS:

1. Ramesh Doebelin. E.O, "Measurement Systems Application and Design", McGraw Hill International, New York, 2004.
2. Nakra B.C and Chaudhary K.K, "Instrumentation Measurement and Analysis", Second Edition, Tata McGraw-Hill Publication Ltd.2006.

REFERENCE WEBSITE:

1. https://onlinecourses.nptel.ac.in/noc23_ee105/preview
2. https://onlinecourses.nptel.ac.in/noc25_ee76/preview

CO-PO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-
CO*	2.8	2.6	-	-	-	-	-	-	-	-	-	-

IV B. Tech–VII Semester

230CS472A	**COMPUTER NETWORKS (OPEN ELECTIVE-IV)**	**L T P C 3 0 0 3**

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the different types of networks
2. To discuss the software and hardware components of a network
3. To develop an understanding of the principles of computer networks
4. To familiarize with OSI model and the functions of layered structure
5. To explain networking protocols, algorithms and design perspectives

UNIT –1: INTRODUCTION (9)

Types of Computer Networks, Broadband Access Networks, Mobile and Wireless Access Networks, Content Provider Networks, Transit networks, Enterprise Networks, Network technology from local to global, Personal Area Networks, Local Area Networks, Home Networks, Metropolitan Area Networks, Wide Area Networks, Internetworks, Network Protocols, Design Issues, Protocol Layering, Connections and Reliability, Service Primitives, The Relationship of Services to Protocols, Reference Models, The OSI Reference Model, The TCP/IP Reference Model, A Critique of the OSI Model and protocols, A Critique of the TCP/IP Reference Model and protocols.

UNIT –2: THE DATA LINK LAYER: (9)

Guided Transmission Media, Persistent Storage, Twisted Pairs, Coaxial Cable, Power Lines, Fiber Optics, Data Link Layer Design Issues, Services provided to the Network Layer, Framing, Error Control, Flow Control, Error Detection and Correction, Error-Correcting Codes, Error-Detecting Codes, Elementary Data Link Protocols, Simplex Link Protocols, Stop-and-Wait Protocol, Sliding Window Protocols, Multiple Frames in Flight, Examples of Full-Duplex Sliding Window Protocols, Channel Allocation Problem, Static Channel Allocation, Dynamic Channel Allocation, Multiple Access Protocols, ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited Contention Protocols, Wireless LAN Protocols, Ethernet, Classic Ethernet, Ethernet Performance, Switched Ethernet, Fast Ethernet, Gigabit Ethernet, 10-Gigabit Ethernet,40- and 100-Gigabit Ethernet, Retrospective on Ethernet.

UNIT –3: THE NETWORK LAYER: (9)

Network Layer Design Issues, Store-and-Forward Packet Switching, Services provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection-Oriented Service, Comparison of Virtual-Circuit and Datagram Networks, Routing Algorithms in a Single Network,

The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing within a Network, Broadcast Routing, Multicast Routing, Anycast Routing, Traffic Management at the Network Layer, The Need for Traffic Management, Congestion, Approaches to Traffic Management, Internetworking, Internetworks: An Overview, How networks differ, Connecting Heterogeneous Networks, Connection Endpoints Across Heterogeneous Networks, Internetwork Routing: Routing Across Multiple Networks.

UNIT –4: THE TRANSPORT LAYER: (9)

The Transport Service, Services Provided to the Upper Layers, Transport Service Primitives, Berkeley Sockets, An Example of Socket Programming: An Internet File

Server, Elements of Transport Protocols, Addressing, Connection Establishment, Connection Release, Error Control and Flow Control, Multiplexing, Crash Recovery, Congestion Control, Desirable Bandwidth Allocation, Regulating the Sending Rate, Wireless Issues, The Internet Transport Protocols: UDP, Introduction to UDP, Remote Procedure Call, Real-Time Transport Protocols, The Internet Transport Protocols: TCP, Introduction to TCP, The TCP Service Model, The TCP Protocol, The TCP Segment Header, TCP Connection Establishment, TCP Connection Release.

UNIT –5: THE APPLICATION LAYER: (9)

Electronic Mail, Architecture and Services, The User Agent, Message Formats, Message Transfer, Final Delivery, The World Wide Web, Architectural Overview, Static Web Objects, Dynamic Web Pages and Web Applications, HTTP and HTTPS, Web Privacy, Content Delivery, Content and Internet Traffic, Server Farms and Web Proxies, Content Delivery Networks, Peer-To-Peer Networks, Evolution of the Internet.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Identify the software and hardware components of a computer network	**PO1, PO2, P03, PO4**
CO2	Explain the functionality of each layer of a computer network	**PO1, PO2, P03**
CO3	Identify and analyze the flow control, congestion control, and routing issues	**PO1, PO2, P03, PO4**
CO4	Analyze and interpret the functionality and effectiveness of the routing protocols	**PO1, PO2, P03, PO4**
CO5	Understand Internet application architecture and protocols (email, web, HTTP/HTTPS) for efficient and secure communication.	**PO1, PO2, P03,**

TEXT BOOKS:

1. Andrew Tanenbaum, Feamster Wetherall, Computer Networks, 6th Edition, Global Edition

REFERENCE BOOKS:

1. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, McGraw Hill Publication, 2017.
2. James F. Kurose, Keith W. Ross, Computer Networking: A Top-Down Approach, 6th Edition, Pearson, 2019.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/108/102/108102121/
2. https://nptel.ac.in/syllabus/108103009

CO-PO MAPPING:

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

IV B. Tech–VII Semester

230CS472B	**IOT CONCEPTS AND APPLICATIONS (OPEN ELECTIVE-IV)**	**L T P C** **3 0 0 3**

PRE-REQUISITES: Computer Networks

COURSE EDUCATIONAL OBJECTIVES:

1. Understand the basics of Internet of Things and protocols.
2. Discuss the requirement of IoT technology
3. Introduce some of the application areas where IoT can be applied.
4. Understand the vision of IoT from a global perspective, understand its applications, determine its market perspective using gateways, devices and data management

UNIT-I INTRODUCTION TO IOT (9)

Definition and Characteristics of IoT, physical design of IoT, IoT protocols, IoT communication models, IoT Communication APIs, Communication protocols, Embedded Systems, IoT Levels and Templates

UNIT-II PROTOTYPING IOT OBJECTS USING MICROPROCESSOR MICROCONTROLLER (9)

Working principles of sensors and actuators, setting up the board – Programming for IoT, Reading from Sensors, Communication: communication through Bluetooth, Wi-Fi.

UNIT-III IOT ARCHITECTURE AND PROTOCOLS (9)

Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, Protocols- 6LowPAN, RPL, CoAP, MQTT, IoT frameworks- Thing Speak.

UNIT- IV DEVICE DISCOVERY AND CLOUD SERVICES FOR IOT (9)

Device discovery capabilities- Registering a device, Deregister a device, Introduction to Cloud Storage models.

UNIT-V UAV IOT (9)

Introduction to Unmanned Aerial Vehicles/Drones, Drone Types, Applications: Defense, Civil, Environmental Monitoring; UAV elements and sensors- Arms, motors, Electronic Speed Controller (ESC), GPS, IMU, Ultrasonic sensors; UAV Software –Ardupilot, Mission Planner, Internet of Drones (IoD)- Case study FlytBase.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand general concepts of Internet of Things.	**PO1, PO2, P03, PO4**
CO2	Apply design concept to IoT solutions.	**PO1, PO2, P03**

CO3	Analyze various M2M and IoT architectures.	**PO1, PO2, P03, PO4**
CO4	Evaluate design issues in IoT applications.	**PO1, PO2, P03, PO4**
CO5	Create IoT solutions using sensors, actuators and devices	**PO1, PO2, P03,**

TEXT BOOKS:

1. Vijay Madisetti and Arshdeep Bahga, ___ Internet of Things A Hands-on-Approach, 1st Edition, VPT, 2014.
2. Handbook of unmanned aerial vehicles, K Valavanis; George J Vachtsvanos, New York, Springer, Boston, Massachusetts: Credo Reference, 2014.2016.

REFERENCE BOOKS:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.
2. ArshdeepBahga, Vijay Madisetti - Internet of Things: A Hands-On Approach, Universities Press, 2014.
3. The Internet of Things, enabling technologies and use cases – Pethuru Raj, Anupama C. Raman, CRC Press.
4. Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, 1st Edition, Apress Publications, 2013.
5. Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978-1-4493-9357-1, DGCA RPAS Guidance Manual, Revision 3 – 2020
6. Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs, John Baichtal

REFERENCE WEBSITE:

1. https://www.arduino.cc/
2. https://www.raspberrypi.org/
3. https://nptel.ac.in/courses/106105166/5
4. https://nptel.ac.in/courses/108108098/4

CO-PO MAPPING:

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

23OME472A	**FUNDAMENTALS OF QUALITY MANAGEMENT (OPEN ELECTIVE – IV)**	**L T P C**
		3 0 0 3

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To introduce the fundamental concepts, definitions, and dimensions of quality and Total Quality Management (TQM).
2. To explore the evolution of quality management through historical perspectives and contributions of quality gurus.
3. To explain the core principles of TQM including customer satisfaction, employee involvement, and continuous improvement.
4. To analyze the various TQM tools such as Benchmarking, QFD, FMEA, Six Sigma, and their role in quality enhancement.
5. To provide an understanding of quality systems like ISO 9000, ISO 14000, QS 9000, and the processes for their implementation.

UNIT –1: INTRODUCTION TO QUALITY MANAGEMENT: (9)

Introduction: Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management.

UNIT –2: HISTORICAL REVIEW: (9)

Historical Review: Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies.

UNIT –3: PRINCIPLES OF QUALITY MANAGEMENT: (9)

TQM Principles: Customer Satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment teams, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure Case studies.

UNIT –4: TQM TOOLS: (9)

TQM Tools: Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, The seven tools of quality, Process capability, Concept of Six Sigma, New Seven management tools, Case studies.

UNIT –5: QUALITY SYSTEMS: (9)

Need for ISO 9000 – ISO 9001-2008 Quality System – Benefits of ISO registration – ISO 9000 series of standards – AS 9100, TS16949 and TL 9000 – ISO 9001 Requirements – Implementation – Documentation – Internal and external audits – Registration – TQM implementation in manufacturing and service sectors. Environmental Management System: Introduction – ISO 14000 Series Standards – Concepts of ISO 14001—Requirements of ISO 14001 – Benefits of EMS.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Define and explain the basic concepts of quality, quality costs, and the scope of Total Quality Management.	**PO1,PO2, PO3, PO4**
CO2	Summarize the philosophies and contributions of TQM pioneers and evaluate barriers and enablers for TQM implementation.	**PO1,PO2, PO3, PO4**
CO3	Apply TQM principles such as employee empowerment, customer satisfaction, and supplier partnerships to real-world business scenarios.	**PO1,PO2, PO3, PO4**
CO4	Analyze the application of tools like QFD, FMEA, Six Sigma, and Benchmarking in improving product and process quality	**PO1,PO2, PO3, PO4**
CO5	Evaluate and formulate quality systems like ISO 9000 and ISO 14000, and design documentation and auditing processes.	**PO1,PO2, PO3, PO4**

TEXT BOOKS:

1. Dale H Bester field, Total Quality Management, Fourth Edition, Pearson Education, 2015.
2. Subburaj Ramaswamy, Total Quality Management, Tata Mcgraw Hill Publishing Company Ltd., 2005.
3. Joel E.Ross , Total Quality Management, Third Eition, CRC Press, 2017. Reference Books

REFERENCE BOOKS:

1. Narayana V and Sreenivasan N.S, Quality Management – Concepts and Tasks, New Age International, 1996.
2. Robert L.Flood, Beyond TQM, First Edition, John Wiley & Sons Ltd, 1993.
3. Richard S. Leavenworth & Eugene Lodewick Grant, Statistical Quality Control, Seventh Edition, Tata Mcgraw Hill, 2015
4. Samuel Ho , TQM – An Integrated Approach, Kogan Page Ltd, USA, 1995.

REFERENCE WEBSITE:

1. https://www.investopedia.com/terms/t/total-quality-management-tqm.asp
2. https://blog.capterra.com/what-is-total-quality-management/
3. https://nptel.ac.in/courses/110/104/110104080/

CO-PO MAPPING:

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

IV B Tech - VII Semester

23OSH472A	**FINANCIAL MATHEMATICS (OPEN ELECTIVE – IV)**	**L T P C** **3 0 0 3**

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To provide mathematical foundations for financial modelling, risk assessment and asset pricing.
2. To introduce stochastic models and their applications in pricing derivatives and interest rate modelling.
3. To develop analytical skills for fixed-income securities, credit risk, and investment strategies.
4. To equip students with computational techniques for pricing financial derivatives.
5. Analyze different exotic options such as Barrier, Asian, and Lookback options

UNIT-1: ASSET PRICING AND RISK MANAGEMENT (9)

Fundamental financial concepts: Returns, arbitrage, valuation, and pricing. Asset/Liability management, investment income, capital budgeting, and contingent cash flows. One-period model: Securities, payoffs, and the no-arbitrage principle. Option contracts: Speculation and hedging strategies, CAP Model, Efficient market hypothesis.

UNIT-2: STOCHASTIC MODELS IN FINANCE (9)

Random Walks and Brownian Motion. Introduction to Stochastic Differential Equations (SDEs): Drift and diffusion. Ito calculus: Ito's Lemma, Ito Integral, and Ito Isometry.

UNIT-III: INTEREST RATE AND CREDIT MODELLING (9)

Interest rate models and bond markets. Short-rate models: Vasicek, Cox-Ingersoll-Ross (CIR), Hull & White models, Credit risk modelling: Hazard function and hazard rate.

UNIT-IV: FIXED-INCOME SECURITIES AND BOND PRICING (9)

Characteristics of fixed-income products: Yield, duration, and convexity. Yield curves, forward rates, and zero-coupon bonds. Stochastic interest rate models and bond pricing PDE. Yield curve fitting and calibration techniques, Mortgage-Backed Securities.

UNIT-V: EXOTIC OPTIONS AND COMPUTATIONAL FINANCE (9)

Stochastic volatility models and the Feynman-Kac theorem. Exotic options: Barriers, Asians, and Look backs. Monte Carlo methods for derivative pricing, Black-Scholes-Merton model: Derivation and applications.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Explain the fundamental financial concepts, including arbitrage, valuation, and risk.	**PO1,PO2,PO5,PO11, PO12**
CO2	Apply stochastic models, including Brownian motion and Stochastic Differential Equations (SDEs), in financial contexts.	**PO1,PO2,PO3,PO4,PO5, PO11,PO12**
CO3	Analyze mathematical techniques for pricing options and financial derivatives.	**PO1,PO2,PO3,PO4,PO5,PO6, PO11,PO12**
CO4	Evaluate interest rate models and bond pricing methodologies.	**PO1,PO2,PO3,PO4,PO5, PO11,PO12**
CO5	Utilize computational techniques such as Monte Carlo simulations for financial modeling.	**PO1,PO2,PO3,PO4,PO5, PO11,PO12**

TEXT BOOKS:

1. Ales Cerny, Mathematical Techniques in Finance: Tools for Incomplete Markets, Princeton University Press.
2. S.R.Pliska, Introduction to Mathematical Finance: Discrete-Time Models, Cambridge University Press.

REFERENCE BOOKS:

1. Ioann is Karatzas & Steven E.Shreve, Methods of Mathematical Finance, Springer, NewYork.
2. John C.Hull, Options, Futures, and Other Derivatives, Pearson.

REFERENCE WEBSITE:

1. MIT–Mathematics for Machine Learning https://ocw.mit.edu
2. Coursera – Financial Engineering and Risk Management (Columbia University) https://www.coursera.org/
3. National Stock Exchange (NSE) India-Financial Derivatives https://www.nseindia.com/

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	1	-	-	-	-	-	2	1
CO2	3	3	2	2	2	-	-	-	-	-	1	1
CO3	3	3	2	2	2	1	-	-	-	-	3	2
CO4	3	3	2	2	1	-	-	-	-	-	2	1
CO5	3	3	2	2	3	-	-	-	-	-	2	2
CO*	**3**	**3**	**2**	**2**	**1.8**	**1**					**2**	**1.4**

23OSH472B	SENSORS AND ACTUATORS FOR ENGINEERING APPLICATIONS (OPEN ELECTIVE–IV)	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To provide comprehensive exposure to various types of sensors and actuators, along with their engineering applications.
2. To impart fundamental knowledge of the laws and phenomena governing the operation of sensors and actuators.
3. To explain the working principles and functionality of different sensors and actuators.
4. To educate students on the fabrication techniques and processes involved in sensor development.
5. To identify and explain the appropriate sensors and actuators required for interdisciplinary applications.

UNIT-1 -INTRODUCTION TO SENSORS AND ACTUATORS (9)

Sensors: Types of sensors: temperature, pressure, strain, active and passive sensors, General characteristics of sensors (Principles only), Deposition: Chemical Vapor Deposition, Pattern: photolithography and Etching: Dry and Wet Etching.

Actuators: Functional diagram of actuators, Types of actuators and their basic principle of working: Pneumatic, Electromagnetic, Piezo-electric and Piezo-resistive actuators, Applications of Actuators.

UNIT-2- TEMPERATURE AND MECHANICAL SENSORS (9)

Temperature Sensors: Types of temperature sensors and their basic principle of working: Thermo-resistive sensors: Thermistors, Thermo-electric sensors: Thermocouples, PN junction temperature sensors

Mechanical Sensors: Types of Mechanical sensors and their basic principle of working: Force sensors: Strain gauges, Tactile sensors, Pressure sensors: Piezoresistive, Variable Reluctance Sensor (VRP).

UNIT-3 OPTICAL AND ACOUSTIC SENSORS (9)

Optical Sensors: Basic principle and working of: Photodiodes, Phototransistors and Photoresistors based sensors, Photomultipliers, Infrared sensors: thermal, Passive Infra-Red, Fiber based sensors and Thermopiles Acoustic Sensors: Principle and working of Ultrasonic sensors, Piezo-electric resonators, Microphones

UNIT-4- MAGNETIC AND ELECTROMAGNETIC SENSORS (9)

Motors as actuators (linear, rotational, stepping motors), magnetic valves, inductive sensors (LVDT, RVDT, and Proximity), Hall Effect sensors, Magneto-resistive sensors, Magneto strictive sensors and actuators.

UNIT-5-CHEMICAL AND RADIATION SENSORS (9)

Chemical Sensors: Principle and working of Electro-chemical, Thermo-chemical, Gas, pH, Humidity and moisture sensors.

Radiation Sensors: Principle and working of Ionization detectors, Scintillation detectors, Semiconductor radiation detectors and Microwave sensors (resonant, reflection, transmission)

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Classify various types of sensors and actuators along with their key characteristics.	**PO1,PO2,PO3, PO4,PO5**
CO2	Review the working principles and applications of temperature and mechanical sensors.	**PO1,PO2,PO3, PO4,PO5**
CO3	Explain the construction and functionality of different optical and mechanical sensors.	**PO1,PO2,PO3, PO4,PO5**
CO4	Analyze the operational principles and applications of optical and acoustic sensors.	**PO1,PO2,PO3, PO4**
CO5	Interpret the significance of smart materials in the design and development of advanced devices.	**PO1,PO2,PO3, PO4**

TEXTBOOKS:

1. Sensors and Actuators – Clarence W. de Silva, CRC Press, 2nd Edition, 2015
2. Sensors and Actuators, D.A.Hall and C.E.Millar, CRC Press, 1999

REFERENCE BOOKS:

1. Sensors and Transducers- D.Patranabhis, Prentice Hall of India (Pvt) Ltd. 2003
2. Measurement, Instrumentation, and Sensors Handbook-John G.Webster, CRC press 1999
3. Sensors – A Comprehensive Sensors- Henry Bolte, John Wiley.
4. Handbook of modern sensors, Springer, Stefan Johann Rupitsch.

REFERENCE WEBSITE:

1. https://onlinecourses.nptel.ac.in/noc21_ee32/preview

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	-
CO2	3	3	2	1	1	-	-	-	-	-	-	-
CO3	3	3	1	1	1	-	-	-	-	-	-	-
CO4	3	2	1	1	-	-	-	-	-	-	-	-
CO5	3	3	1	1	-	-	-	-	-	-	-	-
CO*	**3**	**2.8**	**1.4**	**1.2**	**1**							

IV B Tech- VII Semester

23OSH472C	**CHEMISTRY OF NANOMATERIALS AND APPLICATIONS**	**L T P C**
	(OPEN ELECTIVE – IV)	**3 0 0 3**

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To understand basics and characterization of nano materials.
2. To understand synthetic methods of nanomaterials.
3. To apply various techniques for charterization of nanomaterials.
4. To understand Studies of Nano-structured Materials
5. To enumerate the applications of advanced nanomaterials in engineering

UNIT – 1 BASICS AND CHARACTERIZATION OF NANOMATERIALS (9)

Introduction, Scope of nanoscience and nanotechnology, nanoscience in nature, classification of nanostructured materials, importance of nanomaterials.

Unit – 2 SYNTHESES OF NANOMATERIALS: (9)

Top-Down approach, Inert gas condensation, arc discharge method, aerosol synthesis, plasma arc technique, ion sputtering, laser ablation, laser pyrolysis, and chemical vapour deposition method, electrodeposition method, high energy ball milling method.

Synthetic Methods: Bottom-Up approach, Sol-gel synthesis, microemulsions or reverse micelles, co-precipitation method, solvothermal synthesis, hydrothermal synthesis, microwave heating synthesis and son chemical synthesis.

UNIT-3 TECHNIQUES FOR CHARACTERIZATION: (9)

Diffraction technique, spectroscopy techniques, electron microscopy techniques for the characterization of nanomaterials, BET method for surface area analysis, dynamic light scattering for particle size determination.

UNIT-4 STUDIES OF NANO-STRUCTURED MATERIALS: (9)

Synthesis, properties and applications of the following nanomaterials -fullerenes, carbon nanotubes,2D-nanomaterial(Graphene),core-shell, magnetic nanoparticles, thermoelectric materials, non-linear optical materials.

UNIT-5 ADVANCED ENGINEERING APPLICATIONS OF NANOMATERIALS: (9)

Applications of Nano Particle, nanorods, nano wires, Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.

Total Hours: 45

COURSE OUTCOMES:

	On successful completion of the course, students will be able to	POS
CO1	Classify the nanostructure materials; describe scope of nanoscience and importance technology.	**PO1,PO2, PO3, PO4, PO5, PO7**
CO2	Describe the top-down approach, explain aerosol synthesis and plasma arc technique, differentiate chemical vapor deposition method and electrode position method, Discuss about high energy ball milling.	**PO1, PO2, PO3,PO4, PO5, PO7**
CO3	Discuss different technique for characterization of nanomaterial, explain electron microscopy	**PO1, PO2, PO3, PO4, PO5, PO7**

C04	Explain synthesis and properties and applications of nanomaterials, discuss about fullerenes and carbon nanotubes, Differentiate nanomagnetic materials and thermoelectric materials, nonlinear optical materials.	**PO1, PO2, PO3, PO4, PO5, PO7**
CO5	Illustrate advance engineering applications of Water treatment, sensors, electronic devices, medical domain, civil engineering, chemical engineering, metallurgy and mechanical engineering, food science, agriculture, pollutants degradation.	**PO1,PO2, PO3,PO4, PO5, PO7**

TEXT BOOKS:

1. NANO: The Essentials: T Pradeep, MaGraw-Hill, 2007.
2. Textbook of Nanoscience and nanotechnology: B S Murty, P Shankar, Baldev Rai, BB Rath and James Murday, Univ. Press, 2012.

REFERENCE BOOKS:

1. Concepts of Nano chemistry; Ludovico Cademrtiri and Geoffrey A. Ozin & Geoffrey A. Ozin, Wiley-VCH, 2011.
2. Nanostructures &Nanomaterials; Synthesis, Properties & Applications: Guozhong Cao, Imperial College Press, 2007.

CO-PO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	1	-	2	-	-	-	-	-
CO2	2	3	2	2	2	-	1	-	-	-	-	-
CO3	2	2	3	1	2	-	1	-	-	-	-	-
CO4	3	3	2	2	2	-	2	-	-	-	-	-
CO5	2	2	3	1	1	-	1	-	-	-	-	-
CO*	**2.4**	**2.4**	**2.4**	**1.4**	**1.6**		**1.4**					

IV B Tech- VII Semester

23OSH472D	LITERARY VIBES (OPEN ELECTIVE – IV)	L	T	P	C
		3	0	0	3

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To inculcate passion for esthetic sense and reading skills
2. To encourage respecting others experiences and creative writing
3. To explore emotions, communication skills and critical thinking
4. To educate how books serve as the reflection of history and society
5. To provide practical wisdom and duty of responding to events of the times

UNIT 1: Poetry

1. Ulysses-Alfred Lord Tennyson
2. Night of the Scorpion – Nissim Ezekiel
3. The Second Coming-W.B.Yeats
4. Where the Mind is Without Fear-Rabindranath Tagore

UNIT 2: Drama: Twelfth Night-William Shakespeare

1. Shakespeare-life and works
2. Plot & sub-plot and Historical background of the play
3. Themes and Criticism
4. Style and literary elements
5. Characters and characterization

UNIT 3: Short Story

1. The Luncheon-Somerset Maugham
2. The Happy Prince-Oscar Wild
3. Three Questions–Leo Tolstoy
4. Grief–Antony Chekov

UNIT 4: Prose: Essay and Auto biography

1. My Early Days – Dr. A.P.J. Abdul Kalam
2. The English Teacher – R.K, Narayan
3. The story of My Life-Helen Keller
4. Student Mobs-JB Priestly

UNIT 5: Novel: A Tale of Two Cities-Charles Dickens

1. Charles Dickens-Life and works
2. Plot and Historical background of the novel
3. Themes and criticism
4. Style and literary elements
5. Characters and characterization

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Identify genres, literary techniques and creative uses of language in literary texts.	**PO1,PO2,PO3,PO4,PO5, PO12**
CO2	Explain the relevance of themes found in literary texts to contemporary, Personal and cultural values and to historical forces.	**PO1,PO2,PO3,PO4,PO5, PO12**
CO3	Apply knowledge and understanding of literary texts when responding to others' problems and their own and make evidence– based arguments.	**PO1,PO2,PO3,PO4,PO5, PO6,PO12**
CO4	Analyze the under lying meanings of the text by using the elements of literary texts	**PO1,PO2,PO3,PO4,PO5, PO12**
CO5	Evaluate their own work and that of others critically	**PO1,PO2,PO3,PO4,PO5, PO12**

TEXT BOOKS:

1. Charles Dickens**.** Hard Times. (Sangam A bridged Texts) Vantage Press,1983
2. DENTJC. William Shakespeare. Twelfth Night**.** Oxford University Press,2016.

REFERENCES BOOKS:

1. W Jong, History of English Literature**,** Rupa Publications India; First Edition 2015.
2. RK Kaushik and SC Bhatia. Essays, Short Stories and One Act Plays, Oxford University Press, 2018.
3. Dhanvel, SP. English and Soft Skills, Orient Blackswan,2017.
4. New Horizon, Pearson publications, NewDelhi2014
5. Vimala Ramarao, Explorations Volume-II, Prasaranga Bangalore University,2014**.**
6. Dev Neira, Anjana & Co. Creative Writing: A Beginner's Manual. Pearson India, 2008.

REFERENCES WEBSITE:

1. https://www.litcharts.com/poetry/alfred-lord-tennyson/ulysses
2. https://www.litcharts.com/lit/ain-t-i-a-woman/summary-and-analysis
3. https://englishliterature.education/articles/poetry-analysis/the-second-coming-by-w-b-yeats-critical-analysis-summary-and-line-by-line-explanation/#google_vignette
4. https://sirjitutorials.com/where-the-mind-is-without-fear-poem-notes-explanation/
5. https://www.litcharts.com/lit/twelfth-night/themes

CO-PO MAPPING:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	1
CO2	3	3	2	3	2	-	-	-	-	-	-	2
CO3	3	3	3	3	2	1	-	-	-	-	-	2
CO4	3	3	2	2	1	-	-	-	-	-	-	1
CO5	3	3	3	3	2	-	-	-	-	-	-	2
CO*	**3**	**3**	**2.4**	**2.6**	**1.6**	**1**						**1.6**

IV B Tech- VII Semester

23OPEN472	**INTRODUCTION TO QUANTUM COMPUTING (OPEN ELECTIVE – IV)**	**L T P C**
		3 0 0 3

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To introduce the principles and mathematical foundations of quantum computation.
2. To understand quantum gates, circuits, and computation models.
3. To explore quantum algorithms and their advantages over classical ones.
4. To develop the ability to simulate and write basic quantum programs.
5. To understand real-world applications and the future of quantum computing in AI, cryptography, and optimization.

UNIT – 1 FUNDAMENTALS OF QUANTUM MECHANICS AND LINEAR ALGEBRA (9)
Classical vs Quantum Computation, Complex Numbers, Vectors, and Matrices, Hilbert Spaces and Dirac Notation, Quantum States and Qubits, Superposition and Measurement, Tensor Products and Multi-Qubit Systems.

Unit – 2 QUANTUM GATES AND CIRCUITS: (9)
Quantum Logic Gates: Pauli, Hadamard, Phase, Controlled Gates and CNOT, Unitary Operations and Reversibility, Quantum Circuit Representation, Quantum Teleportation, Simulation of Quantum Circuits.

UNIT-3 QUANTUM ALGORITHMS AND COMPLEXITY: (9)
Quantum Parallelism and Interference, Deutsch and Deutsch-Jozsa Algorithms, Grover‵s Search Algorithm, Shor‵s Factoring Algorithm, Quantum Fourier Transform, Complexity Classes: BQP, P, NP, and QMA.

UNIT-4 QUANTUM PROGRAMMING AND SIMULATION PLATFORMS: (9)
Introduction to Qiskit and IBM Quantum Experience, Writing Quantum Circuits in Qiskit, Measuring Qubits and Results, Classical-Quantum Hybrid Programs, Noisy Intermediate-Scale Quantum (NISQ) Systems, Limitations and Current State of Quantum Hardware.

UNIT-5 APPLICATIONS AND FUTURE OF QUANTUM COMPUTING: (9)
Quantum Machine Learning: Basics and Models, Quantum Cryptography and Quantum Key Distribution, Quantum Algorithms in AI and Optimization, Quantum Advantage and Supremacy, Ethical and Societal Impact of Quantum Technologies, Future Trends and Research Directions.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POS
CO1	Explain the fundamental concepts of quantum mechanics used in computing.	**PO1, PO2**
CO2	Construct and analyze quantum circuits using standard gates.	**PO1, PO2, PO3, PO5**
CO3	Apply quantum algorithms like Deutsch-Jozsa, Grover‟s, and Shor‟s.	**PO1, PO2,PO3, PO4, PO5**
C04	Develop simple quantum programs using Qiskit or similar platforms.	**PO2, PO3, PO4, PO5**
CO5	Analyze applications and challenges of quantum computing in real-world domains.	**PO2, PO4**

TEXT BOOKS:

1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.

REFERENCE BOOKS:

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.

CO-PO MAPPING:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	–	–	–	–	–	–	–	–	–	–
CO2	3	3	2	-	2	–	–	–	–	–	–	–
CO3	3	3	2	2	2	–	–	–	–	–	–	–
CO4	-	2	3	3	3	–	–	–	–	–	–	–
CO5	-	3	-	2	-	–	–	–	–	–	–	–
CO*	**3**	**2.6**	**1.4**	**1.4**	**1.4**	–	–	–	–	–	–	–

23EEE474L	POWER SYSTEMS AND SIMULATION LAB (Skill Enhancement Course)	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To do the experiments (in machines lab) on various power system concepts like determination of sequence impedance, fault analysis, finding of sub transient reactances.
2. To draw the equivalent circuit of three winding transformer by conducting a suitable experiment.
3. To develop the MATLAB program for formation of Y and Z buses. To develop the MATLAB programs for Gauss-Seidel and fast decoupled load flow studies.
4. To develop the SIMULINK model for single area load frequency problem

CHOOSE ANY TEN FROM THE FOLLOWING LIST:

1. Determination of Sequence Impedances of Cylindrical Rotor Synchronous Machine
2. Determination of Sequence Impedances of salient pole Synchronous Machine
3. LG Fault Analysis on an un loaded alternator
4. LL Fault Analysis on conventional phases
5. LLG Fault Analysis
6. LLLG Fault Analysis
7. Determination of Sub transient reactance of salient pole synchronous machine Equivalent circuit of three winding transformer.
8. YBus formation using Soft Tools
9. ZBus formation using Soft Tools
10. Gauss-Seidel load flow analysis using Soft Tools
11. Newton-Raphson load flow analysis using Soft Tools
12. Fast decoupled load flow analysis using Soft Tools
13. Solve the Swing equation and Plot the swing curve
14. Develop a model for a uncontrolled single area load frequency control problem and simulate the same using Soft Tools.
15. Develop a model for PI controlled single area load frequency control problem and simulate the same using Soft Tools.
16. Develop a model for a uncontrolled two area load frequency control problem and simulate the same using Soft Tools.
17. Develop a model for a uncontrolled two area load frequency control problem and simulate the same using Soft Tools.
18. Develop a model for PI controlled two area load frequency control problem and simulate the same using Soft Tools.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Analyze and determine the sequence impedances of both cylindrical rotor and salient pole synchronous machines to understand their behavior under various fault conditions.	PO1
CO2	Conduct fault analysis (LG, LL, LLG, and LLLG) on synchronous machines and interpret the in faults on system stability and performance.	PO2
CO3	Develop and simulate load flow analysis using various methods (Gauss-Seidel, Newton-Raphson, Decoupled) and formulate the YBus and Z Bus for power system networks.	PO3
CO4	Model load frequency control problems for single and two-area systems, employing both uncontrol PI-controlled approaches to evaluate system performance.	PO5
CO5	Simulate load frequency control problems for single and two area systems.	PO8
CO6	Follow ethical principles in designing, simulating and implementing various circuits.	PO9
CO7	Do experiments effectively as an individual and as a member in a group.	PO10
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO11
C09	Continue updating their skill related to semiconductors implementation for various application during their life time	PO12

Reference Link:

https://www.ee.iitb.ac.in/~vlabsync/template/vlab/index.html

CO-PO Mapping:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2		3										
CO3			3									
CO4					3							
CO5								3				
CO6									3			
CO7										3		
CO8											3	
CO9												3
CO*	**3**	**3**	**3**		**3**			**3**	**3**	**3**	**3**	**3**

IV B.Tech. - VII Semester

23EEE471P	EVALUATION INDUSTRY INTERNSHIP	L	T	P	C
		-	-	-	2

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. To provide students with practical exposure to industrial, organizational, or professional work environments related to their engineering discipline.
2. To enable students to apply theoretical knowledge and technical skills acquired during the undergraduate program to solve real-world engineering problems.
3. To develop professional competencies such as teamwork, communication, leadership, ethical practices, and workplace discipline.
4. To enhance students' ability to identify, analyze, and execute engineering projects through experiential learning and industry interaction.
5. To prepare students for successful careers and lifelong learning by fostering industry readiness, innovation, and professional development.

INTERNSHIP SCHEME

1. At the end of the sixth semester, every student shall mandatorily register for and undergo an internship (onsite or virtual) of a minimum duration of 6–8 weeks with well-defined objectives. The evaluation of the internship shall be conducted during the seventh semester of the final year.
2. The internship shall be completed in collaboration with local industries, Government organizations, construction agencies, power projects, software MNCs, or other industries relevant to the student's area of specialization in the undergraduate program.
3. At the end of the internship, a certificate of successful completion issued by the industry/organization shall be included in the internship report.
4. The evaluation of the summer internship shall be carried out by a Departmental Committee. The student shall submit the Summer Internship Report to the concerned department and appear for an oral presentation before the Departmental Committee comprising the Head of the Department, the Internship Supervisor, and a senior faculty member of the department.
5. The Internship Report and the Oral Presentation shall carry 50% weightage each. The internship shall be evaluated for a total of 100 external marks. There shall be no internal marks for the Summer Internship. A student shall secure a minimum of 40% marks for successful completion of the internship.
6. The department shall facilitate and monitor student internship programs. Completion of the internship is mandatory. If a student fails to complete the internship, he/she shall not be eligible for the award of the degree. In such cases, the student shall repeat and successfully complete the internship.

COURSE OUTCOMES:

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

COs	Course Outcomes	POs
CO1	Apply engineering knowledge and technical skills to perform tasks in a professional work environment.	**PO1**
CO2	Identify, formulate, and analyze real-world engineering problems encountered during the internship.	**PO2**
CO3	Develop appropriate solutions using modern engineering principles and methodologies.	**PO3**
CO4	Investigate practical engineering problems through data collection, analysis, and interpretation.	**PO4**
CO5	Utilize modern engineering tools, software, and technologies relevant to the internship domain.	**PO5**
CO6	Understand the impact of engineering solutions on society, health, safety, legal, and cultural aspects.	**PO6**
CO7	Recognize the importance of sustainable practices and environmental considerations in engineering activities.	**PO7**
CO8	Demonstrate professional ethics, integrity, and responsibility in the workplace.	**PO8**
CO9	Function effectively as an individual and as a member of multidisciplinary teams.	**PO9**
CO10	Communicate technical information effectively through reports, presentations, and professional interactions.	**PO10**
CO11	Understand project management practices, organizational structures, and resource utilization in industry.	**PO11**
CO12	Develop self-learning ability, adaptability, and commitment to lifelong learning through industrial exposure.	**PO12**

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	3	-	-	-	-	-	-
CO7	-	-	-	-	-	-	3	-	-	-	-	-
CO8	-	-	-	-	-	-	-	3	-	-	-	-
CO9	-	-	-	-	-	-	-	-	3	-	-	-
CO10	-	-	-	-	-	-	-	-	-	3	-	-
CO11	-	-	-	-	-	-	-	-	-	-	3	-
CO12	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

23MAC471U	GENDER SENSITIZATION	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

1. To enable students to understand the gender related issues, vulnerability of women and men
2. To familiarize them about constitutional safeguard for gender equality
3. To expose the students to debates on the politics and economics of work
4. To help students reflect critically on gender violence
5. To make them understand that gender identities and gender relations are part of culture as they shape the way daily life is lived in the family as well as wider community and the workplace.

UNIT-1: 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-2: 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- Demographic Consequences-Gender Spectrum -

Unit-3: 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-4: GENDER-BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment - Domestic Violence - Different forms of violence against women - Causes of violence, impact of violence against women - Consequences of gender-based violence

Unit-5: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language- Just Relationships.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand the basic concepts of gender and its related terminology	**PO1,PO2,PO3**
CO2	Identify the biological, sociological, psychological and legal aspects of gender.	**PO1,PO2,PO3**
CO3	Use the knowledge in understanding how gender discrimination works in our society and how to counter it.	**PO1,PO2**
CO4	Analyze the gendered division of labour and its relation to politics and economics.	**PO1,PO2,PO3**
CO5	Appraise how gender-role beliefs and sharing behaviour are associated with more well-being in all culture and gender groups	**PO1,PO2**

TEXT BOOKS

1. A.Suneetha, Uma Bhrugubanda, et al. *Towards a World of Equals: A Bilingual Textbook on Gender‖*, Telugu Akademi, Telangana, 2015.
2. Butler, Judith. *Gender Trouble: Feminism and the Subversion of Identity.* UK Paperback Edn. March 1990.

REFERENCE BOOKS

1. Wtatt, Robin and Massood, Nazia, *Broken Mirrors: The dowry Problems in India,* London : Sage Publications, 2011
2. Datt, R. and Kornberg, J.(eds), *Women in Developing Countries, Assessing Strategies for Empowerment,* London: Lynne Rienner Publishers, 2002
3. Singh, Direeti, *Women and Politics World Wide*, New Delhi, Axis Publications, 2010
4. Raj Pal Singh, Anupama Sihag, *Gender Sensitization: Issues and Challenges* (English, Hardcover), Raj Publications, 2019
5. A.Revathy& Murali, Nandini, *A Life in Trans Activism* (Lakshmi Narayan Tripathi). The University of Chicago Press, 2016.

REFENCE WEBSITE:

1. https://onlinecourses.swayam2.ac.in/nou24_hs53/preview
2. https://onlinecourses.swayam2.ac.in/cec23_hs29/preview
3. https://onlinecourses.swayam2.ac.in/nou25_ge38/preview

CO-PO MAPPING:

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

IV B.Tech. - VIII Semester

		L	T	P	C
23EEE481P	**INTERNSHIP (Common to All Branches)**	-	-	24	4

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. To provide students with practical exposure to industrial, organizational, or professional work environments related to their engineering discipline.
2. To enable students to apply theoretical knowledge and technical skills acquired during the undergraduate program to solve real-world engineering problems.
3. To develop professional competencies such as teamwork, communication, leadership, ethical practices, and workplace discipline.
4. To enhance students' ability to identify, analyze, and execute engineering projects through experiential learning and industry interaction.
5. To prepare students for successful careers and lifelong learning by fostering industry readiness, innovation, and professional development.

INTERNSHIP SCHEME

1. In the final semester, the student should mandatorily register and undergo internship (onsite/virtual) and in parallel he/she should work on a project with well-defined objectives.
2. It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Power projects, software MNCs or any industries in the areas of concerned specialization of the Undergraduate program.
3. At the end of the semester the candidate shall submit an internship completion certificate and an internship project report.
4. Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department.
5. A certificate of successful completion from industry shall be included in the report.
6. The report and the oral presentation shall carry 50% weight age each. It shall be evaluated for 100 external marks. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion.
7. The department shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

COURSE OUTCOMES:

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

COs	Course Outcomes	POs
CO1	Apply engineering knowledge and technical skills to perform tasks in a professional work environment.	**PO1**
CO2	Identify, formulate, and analyze real-world engineering problems encountered during the internship.	**PO2**
CO3	Develop appropriate solutions using modern engineering principles and methodologies.	**PO3**
CO4	Investigate practical engineering problems through data collection, analysis, and interpretation.	**PO4**
CO5	Utilize modern engineering tools, software, and technologies relevant to the internship domain.	**PO5**
CO6	Understand the impact of engineering solutions on society, health, safety, legal, and cultural aspects.	**PO6**
CO7	Recognize the importance of sustainable practices and environmental considerations in engineering activities.	**PO7**
CO8	Demonstrate professional ethics, integrity, and responsibility in the workplace.	**PO8**
CO9	Function effectively as an individual and as a member of multidisciplinary teams.	**PO9**
CO10	Communicate technical information effectively through reports, presentations, and professional interactions.	**PO10**
CO11	Understand project management practices, organizational structures, and resource utilization in industry.	**PO11**
CO12	Develop self-learning ability, adaptability, and commitment to lifelong learning through industrial exposure.	**PO12**

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	3	-	-	-	-	-	-
CO7	-	-	-	-	-	-	3	-	-	-	-	-
CO8	-	-	-	-	-	-	-	3	-	-	-	-
CO9	-	-	-	-	-	-	-	-	3	-	-	-
CO10	-	-	-	-	-	-	-	-	-	3	-	-
CO11	-	-	-	-	-	-	-	-	-	-	3	-
CO12	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

IV B.Tech. - VIII Semester

23EEE482P	PROJECT WORK (Common to All Branches)	L	T	P	C
		-	-	-	8

PRE-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. Identify and explore contemporary research problems and emerging areas in the field of Mechanical Engineering through comprehensive literature review and problem analysis.
2. Analyze, compare, and evaluate existing methodologies, technologies, and solutions related to the identified problem to determine research gaps and opportunities.
3. Formulate and develop a systematic project plan by applying engineering principles, design methodologies, and appropriate tools to address the identified problem.
4. Execute experiments, simulations, or design activities collaboratively as a team, and collect, analyze, and interpret the obtained results for effective decision-making.
5. Prepare technical reports, dissertations, and presentations to communicate project outcomes, findings, and recommendations effectively to academic and professional audiences.

PROJECT WORK SCHEME

1. **Objective of Project Work:** The Project Work aims to provide students with an opportunity to apply the knowledge and skills acquired during the course of study to solve real-world engineering problems. The project may involve design, fabrication, analysis, simulation, research, product development, management studies, or computer-based applications relevant to industry and society. Students shall select the project topic in consultation with the faculty guide and with the approval of the concerned department.
2. **Industry/Research Organization Projects:** In exceptional cases, students may be permitted to carry out their project work in an Industry, Research Organization, or other approved institution based on the recommendation of the Head of the Department. Such projects shall be jointly supervised by a faculty member from the department and an expert from the host organization. Students are required to maintain regular contact with both supervisors and participate in all project review meetings conducted by the department.
3. **Project Monitoring and Reviews:** The project work shall be continuously monitored through a minimum of three review presentations conducted by the Departmental Project Review Committee. The reviews are intended to assess the progress of work, technical competence, problem-solving ability, and adherence to the project schedule. Students shall also be trained in technical report writing, seminar presentation, and viva-voce examination skills.
4. **Project Report Submission:** The project report shall be prepared in accordance with the prescribed guidelines of the institution and submitted to the Head of the Department before the commencement of the Viva-Voce Examination.
5. **Project Presentation:** Each student or project team shall present the progress and outcomes of the project before the Review Committee at scheduled intervals. The presentation shall demonstrate the objectives, methodology, results, conclusions, and contributions of the project.

6. **Evaluation Procedure:** The Review Committee shall be constituted by the Head of the Department. The final evaluation of the project work shall be based on the quality of the project report, project demonstration, oral presentation, and Viva-Voce Examination.
7. **Distribution of Marks: Total: 200 Marks**
    - **Internal Evaluation – 60 Marks**
        - **Departmental Project Review Committee – 30 Marks**
            - Evaluation based on project progress, demonstration, presentation, and overall performance.
        - **Project Report: 15 Marks**
        - **Seminar/Presentation: 15 Marks**
    - **External Evaluation – 140 Marks**
        - Viva-Voce Examination conducted jointly by an Internal Examiner and an External Examiner appointed by the Principal.
8. **Project Exhibition:** At the end of the semester, all completed projects shall be showcased within the department for the benefit of students, faculty members, and other stakeholders. The exhibition shall facilitate knowledge sharing and promote innovation and research culture.
9. **Requirement for Successful Completion:** Successful completion and evaluation of the Project Work are mandatory for the award of the degree. Students who fail to complete the project work or fail to secure the minimum required performance shall not be eligible for the award of the degree and shall be required to repeat and successfully complete the project work as per the regulations of the institution.

COURSE OUTCOMES:

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

COs	Course Outcomes	POs
CO1	Demonstrate in-depth knowledge and understanding of the selected project domain and its underlying engineering principles.	**PO1**
CO2	Identify, analyze, and formulate complex engineering problems through literature review, data collection, and critical evaluation to arrive at substantiated conclusions.	**PO2**
CO3	Design and develop innovative engineering solutions, systems, components, or processes to address the identified project problem.	**PO3**
CO4	Conduct investigations, experiments, simulations, or analytical studies and interpret the results to validate the proposed solution.	**PO4**
CO5	Apply appropriate modern engineering tools, techniques, software, and resources necessary for the successful execution of the project work.	**PO5**
CO6	Evaluate the societal relevance and applicability of project outcomes for sustainable development and community welfare.	**PO6**
CO7	Assess the environmental impact and sustainability aspects associated with the proposed project solution.	**PO7**
CO8	Demonstrate professional ethics, integrity, and responsibility while planning and executing project activities.	**PO8**
CO9	Function effectively as an individual, team member, or team leader in a multidisciplinary project environment.	**PO9**

CO10	Communicate technical ideas, project progress, findings, and outcomes effectively through reports, presentations, demonstrations, and viva-voce examinations.	**PO10**
CO11	Apply project management principles, including planning, scheduling, resource allocation, cost estimation, and time management during project execution.	**PO11**
CO12	Recognize the importance of lifelong learning and continuously enhance technical competence in the chosen area of specialization.	**PO12**

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	3	-	-	-	-	-	-
CO7	-	-	-	-	-	-	3	-	-	-	-	-
CO8	-	-	-	-	-	-	-	3	-	-	-	-
CO9	-	-	-	-	-	-	-	-	3	-	-	-
CO10	-	-	-	-	-	-	-	-	-	3	-	-
CO11	-	-	-	-	-	-	-	-	-	-	3	-
CO12	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**