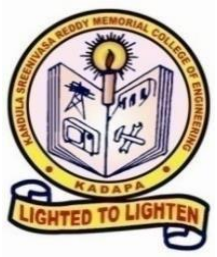

Kandula Sreenivasa Reddy Memorial College of Engineering (Autonomous)

Kadapa – 516005, A.P.

(Approved by AICTE, Affiliated to JNTUA, Ananthapuram, Accredited by NAAC)

(An ISO 9001-2008, ISO 14001:2015 Certified Institution)

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B. Tech (Regular)

(Effective for the students admitted into I year from the Academic Year 2023-24 onwards and Lateral Entry students admitted into II year from Academic Year: 2024-25 onwards)

Academic Regulations (R23UG)

Course Structure and Syllabus

(I, II, III and IV Sem.)

VISION AND MISSION OF THE INSTITUTE

VISION

To evolve as center of repute for providing quality academic programs amalgamated with creative learning and research excellence to produce graduates with leadership qualities, ethical and human values to serve the nation.

MISSION

M1: To provide high quality education with enriched curriculum blended with impactful teaching-learning practices.

M2: To promote research, entrepreneurship and innovation through industry collaborations.

M3: To produce highly competent professional leaders for contributing to Socio-economic development of region and the nation.

VISION AND MISSION OF THE DEPARTMENT

VISION

To emerge as a department of excellence in the domain of Electrical and Electronics Engineering producing globally component engineers with research acumen having moral and social values.

MISSION

M1: To offer education with skill-based curriculum through innovative pedagogy, enabling the students to engage in lifelong learning.

M2: To establish industry interactions for creating research-oriented culture to invoke the desire among the students for pursuing successful career.

M3: To maintain sustainable environment of learning in which students acquire knowledge and imbibed with social and ethical values.

PROGRAM EDUCATIONAL OBJECTIVES

Program Educational Objectives of the Electrical and Electronics Engineering provides the following wide aspects in connection with the Vision and Mission of the department.
PEO-1: To pursue higher studies or be employed in Electrical and Electronics Engineering or relevant disciplines.

PEO-2: To analyze real life problems and design Electrical and Electronics Engineering systems with appropriate solutions that are technically sound, economically feasible and socially acceptable.

PEO-3: To exhibit professionalism, ethical attitude, communication skills, team work in their profession and adapt to current trends by engaging in lifelong learning.

PROGRAM OUTCOMES

PO1 - Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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

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 engineering practice.

PO9 - Individual and 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

PSO1: Able to apply the knowledge of Science, Mathematics & Electrical Engineering fundamentals to solve complex problems in Electrical Machines, Control Systems, Power Systems & Power Electronics.

PSO2: Able to analyze the performance of Electrical Machines, Power Systems and Control Systems.

PSO3: Able to apply the knowledge of ethical & Management principles required to work on a team as well as to lead a team.

Academic Regulations (R23UG) for B. Tech (Regular-Full time)

(Effective for the students admitted into I year from
the Academic Year **2023-24** 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 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. program.

2. 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).

3. 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 obtainedby 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.

4. 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 ofteaching (Lecture/Tutorial) or two hours of practical work/field work per week.

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 to exit 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 Program

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

S. No.	Category	Breakup of Credits (Total 160)	Percentage oftotal 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 program in Engineering & Technology (B.Tech degree programs) are broadly classified as follows:

S. No.	Broad Course Classification	Course Category	Description
1.	Foundation 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
		Professional Elective Courses (PE)	Includes elective subjects related to the parent discipline / department / branch of Engineering
		Open Elective Courses (OE)	Elective subjects which include inter disciplinary 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 arerelevant 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. Program Pattern

i. Total duration of the of B. Tech (Regular) Program 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 fresher's, with a three-week duration before the commencement of first Semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lecturesby 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 /Scouts & Guides / Community service activities are made mandatory as credit courses for all the under graduate 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 04 Open Elective courses.

ix. Professional Elective Courses, include the elective courses relevant to thechosen 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 VII 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 program. Theinternship 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 program along with the project work.

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

xvi. The college 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. The Principal 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	30
Semester End Examination	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 examinationquestion 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 5 marks for objective paper (20 minutes duration), 20 marks for subjective paper (100 minutes duration) and 5 marks for assignment.
ii) Objective paper shall contain 05 short answer questions with 2 marks each or maximum of 20 bits for 10 marks. Subjective paper shall contain 4 either or type questions (totally eight questions from 1 to 8) of which student has to answer one from each either-or type questions. Each question carries 10 marks. The marks obtained in the subjective paper are condensed to 20 marks, the marks obtained in the objective paper is condensed to 5 marks.

Note:

- The objective paper shall be prepared in line with the quality of competitive examinations questions.
- The subjective paper shall contain 4 either or type questions of equal weightage of 10 marks. Any fraction shall be rounded off to the next higher mark.
- The objective paper shall be conducted by the institution on the day of subjective paper test.
- 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.

Assignments:

The assignments shall aid and hone the daily routine of students.

Assignments shall be stimulating and thought provoking to the student. While some questions may test student's understanding of the subject, there shall be questions that imply connect to real world applications. A variety of questions can posed in assignments.

i. *Number:* A minimum of four assignments shall be given in each subject with one assignment from Unit I to IV of syllabus of that subject.
ii. *Quantum of work*: An assignment shall take about four to six hours of study / work per week. Assignments shall not be overloaded nor under loaded. As a guideline, each assignment may contain five questions, each question taking an hour to answer.
iii. *Marks*: Each assignment must be evaluated for fifty marks. Final marks are obtained by averaging all the assignment marks and reducing it to five marks.
iv. *Deadlines*: Students shall be given at least one-week time to complete and submit assignments. Assignments shall be submitted within deadline. Late submissions should be awarded zero marks.
v. *General*: It is advised to administer assignments using Google Classroom.

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 and III units of syllabus with one / two either or type questions from each unit. The second midterm examination shall be conducted for III, IV and V units with one/two either or type questions from each unit. (Each midterm test shall cover 50% of the syllabus approximately).

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: 20Final mid Semester Marks: (25x0.8) + (20x0.2) = 24

If the student is absent for any one midterm examination, the final mid Semester marksshall 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: AbsentMarks obtained in second mid: 25Final mid Semester Marks: (25x0.8) + (0x0.2) =20

vi) After the course work is over, the student is permitted to improve his / her internal marks of any 3 theory subjects in the entire course. However he/she will have to attend the course work.

b) Semester-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 ‘ 1’ shall contain 10 compulsory short answer questions for a total of 20 marks such that each question carries 2 marks. There shall be 2 short answer questions from each unit.
iii) The questions from ‘2’ to ‘6’ shall be set by covering one unit of the syllabus for each question. 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.

End examination of theory subjects consisting of two parts of different subjects, for Example: Basic Electrical & Electronics 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 totalof 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 markseach. 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 eachquestion.

Practical Courses

a) Practical courses shall be evaluated as tabulated below

Assessment Method	**Marks**
Continuous Internal Assessment	30
Semester End Examination	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) For Continuous internal assessment, Day-to-day work in the laboratory shall be evaluated for 30 marks by the concerned laboratory teacher based on the lab observation, record and performance of student in the laboratory.
c) The semester-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. Mid Semester examination shall be evaluated as above for 30 marks in each part and final mid Semester 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	30
Semester End Examination	70
Total	**100**

Day-to-day work shall be evaluated for 15 marks by the concerned subject teacher basedon 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 secures40% 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) Three batches complete record of laboratory records and Internal and End Semester test papers shall be preserved in the college and shall be produced to the Committees of the University as and when the same are asked for.

g) Revaluation of End Examination Scripts

- Revaluation of End Examination scripts is allowed for theory subjects only by paying requisite fee.
- Procedure for Revaluation: The script will be revaluated by an examiner appointed by the principal. The maximum of revaluation and regular end examination marks will be awarded for that subject. If the deviation is more than 12 marks, the script isreevaluated second time.
- A student can apply for revaluation in a subject only once

h) **Curriculum Delivery:** The curriculum will also be delivered by the industry expert or adjunct faculties, who have industry experience if some MOU is signed between industry and institution.

i) Subjects taught in collaboration with the industry, the assessment will be done by eitherthe industry or the college as decided by the concerned Chairman of the Board

of Studies.

j) The question papers for theory subjects shall be set by faculty members outside of the Institute. The external faculty members for question paper setting shall be appointed by the Principal.

k) Evaluation of answer scripts shall be done by either Internal or External examiners appointed by the Principal. A minimum of 50% of subjects will be evaluated by external examiners.

l) For laboratory subjects, end examination shall be conducted by a committee consisting of two internal examiners. One examiner shall be appointed by Head of Department of concerned Major, and the other examiner shall be appointed by the Principal.

m) For project work viva-voce, end examination shall be conducted by a committee consisting of one internal examiner, one external examiner, and the concerned guide of the student. Internal examiner shall be appointed by Head of Department of concerned Major, and the external examiner shall be appointed by the Principal.

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 conductedby 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 by the principal of the college to evaluate the grades / marks given for a 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 respective BoS chairman at the beginning of the Semester.

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 University. 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).

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, a maximum of 20% ofthe total courses being offered in a particular program are allowed i.e., maximum of 32 credits through MOOCs platform.

i) The College 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 and skill courses only.
iv) The concerned department shall identify the courses permitted for credit transfer.
v) The College 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 college shall ensure no overlap of MOOC exams with that of the end Semester examination schedule. In case of delay in results, the college will re-issue the marks sheet for such students.

viii) Student pursuing courses under MOOCs shall acquire the required credits only aftersuccessful 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 college:
   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 College academic council 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 Head of the department from time to time.

13. Academic Bank of Credits (ABC)

The institution has implemented Academic Bank of Credits (ABC) to promote flexibility ncurriculum 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 andcredit acceptance from students' account.

14. Mandatory 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 inthe 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 Headof the Department, supervisor of the internship and a senior

faculty member of thedepartment. A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% weightage 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 institution.

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, 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 principal and is evaluated for 140 marks.

The college 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 completethe 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 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 program 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 class work 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) The attendance for the registered courses under Honors and regular courses offered for Major degree in a Semester are to be considered separately.

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

viii) 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 program.

ix) 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.

x) 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 offeredby 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/herparent department offering Honors. The parent department shall maintain therecord 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 end Semester 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.

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 shallnot be eligible for readmission into the same class.

vii) If the learning is carried out in blended mode (both offline & online), then the totalattendance of the student shall be calculated considering the offline and online attendance of the student.

viii) For induction program 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) 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. 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.

iv) When a student is detained due to lack of credits/shortage of attendance he/she may bere-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.

Structure of Grading of Academic Performance

Range in which the marks inthe subject fall	**Grade**	**Grade Points Assigned**
90 & above	S (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.

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

The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade point 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.

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
First Class	$\geq 6.5 < 7.5$
Second Class	$\geq 5.5 < 6.5$
Pass Class	$\geq 5.0 < 5.5$

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 college 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 program at the end of first/second/third year.

i) **UG Certificate in (Field of study/discipline)** - Program duration: First year (first two Semesters) of the undergraduate program, 40 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.

ii) **UG Diploma (in Field of study/discipline)** - Program duration: First two years (first four Semesters) of the undergraduate program, 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 candidatesacquire 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)**- Program duration: First three years (first six Semesters) of the undergraduate program, 120 credits.

(b) Entry Policy:

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

Note: The College Academic council 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 program / to establish start-ups. 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 Head of the department shall forward such proposals submitted by thestudents to the principal. An evaluation committee constituted by the College Academic Council 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 program 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:

i. The academic regulations should be read as a whole for purpose of any interpretation.
ii. Malpractices rules-nature and punishments are appended.
iii. Where the words “he”, “him”, “his”, occur in the regulations, they also include “she”, “her”, “hers”, respectively.
iv. 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.
v. 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.
vi. 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.

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ACADEMIC REGULATIONS (R23UG)

FOR B.TECH. (LATERAL ENTRY SCHEME)

*(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year **2024-25** 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 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 is to be completed simultaneously with B.Tech. program.

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 endexamination 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 berounded off to lower digit) in the subjects that have been studied up to V Semester.

And in case if student is already detained for want of credits for particularacademic year, the student may make up the credits through supplementary examsof the above exams before the commencement of IV year I Semester class work ofnext year.

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.

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

B.Tech. Course Structure (R23UG)

B.Tech. I-Semester

S.No.	Category	Course Code	Course Name	L	T	P	Credits
1	BS&H	2321101	Linear Algebra and Calculus	3	0	0	3
2	BS&H	2323102	Chemistry	3	0	0	3
3	Engg Science	23CM105	Basic Civil and Mechanical Engineering	3	0	0	3
4	Engg Science	2305107	Introduction to Programming	3	0	0	3
5	Engg Science	2305109	IT Workshop	0	0	2	1
6	BS&H	2323111	Chemistry Lab	0	0	2	1
7	Engg Science	2303112	Engineering Workshop	0	0	3	1.5
8	Engg Science	2305113	Computer Programming Lab	0	0	3	1.5
9	BS&H	2306117	Health And Wellness, Yoga and Sports	-	-	1	0.5
				12	**0**	**11**	**17.5**

B.Tech. II-Semester

S. No.	Category	CourseCode	Course Name	L	T	P	Credits
1	BS&H	2321201	Differential Equations &Vector Calculus	3	0	0	3
2	BS&H	2324201	Communicative English	2	0	0	2
3	PC	2302202	Electrical Circuit Analysis-1	3	0	0	3
4	BS&H	2322204	Engineering Physics	3	0	0	3
5	Engg Science	23EE206	Basic Electrical & Electronics Engineering	3	0	0	3
6	Engg Science	2303208	Engineering Graphics	1	0	4	3
7	PC	2302203	Electrical Circuits Lab	0	0	3	1.5
8	BS&H	2324210	Communicative EnglishLab	0	0	2	1
9	Engg Science	23EE214	Electrical & ElectronicsEngineering Workshop	0	0	3	1.5
10	BS&H	2322215	Engineering Physics Lab	0	0	2	1
11	BS&H	2306216	NSS / NCC / Scouts &Guides / Community Service	-	-	1	0.5
				15	**0**	**15**	**22.5**

B.Tech. III-Semester

S.No.	Category	Course Code	Course Title	L	T	P	Credits
1	Basic Science	23HS304	Complex Variables and Numerical Methods	3	0	0	3
2	Management Course- I	23HS321	Managerial Economics and Financial Analysis	2	0	0	2
3	Engineering Science	2302301	Electromagnetic Field Theory	3	0	0	3
4	Engineering Science	2304304	Switching Theory and Logic Design	3	0	0	3
5	Professional Core	2302302	Electrical Circuit Analysis-II	3	0	0	3
6	Professional Core	2302303	DC Machines and Transformers	3	0	0	3
7	Professional Core	2302351	Electrical Circuit Analysis and Simulation Lab	0	0	3	1.5
8	Professional Core	2302352	DC Machines and Transformers Lab	0	0	3	1.5
9	Skill Enhancement Course	2305353	Python Programming	0	1	2	2
			Total	**17**	**1**	**8**	**22**

B.Tech. IV-Semester

S.No.	Category	Course Code	Course Title	L	T	P	Credits
1	HSMC	23HS411	Universal Human Values – Understanding Harmony and Ethical Human Conduct	2	1	0	3
2	Professional Core	2304405	Analog Electronic Circuits	3	0	0	3
3	Professional Core	2302401	Induction and Synchronous Machines	3	0	0	3
4	Professional Core	2302402	Control Systems	3	0	0	3
5	Professional Core	2304454	Analog Electronic Circuits Lab	0	0	3	1.5
6	Professional Core	2302451	Induction and Synchronous Machines Lab	0	0	3	1.5
7	Skill Enhancement course	2305453	Data Structures	0	1	2	2
8	Engineering Science	2304453	Design Thinking and Innovation	1	0	2	2
9	Audit Course	23HS431	Environmental Science	2	0	0	-
			Total	**14**	**2**	**10**	**19**
Mandatory Community Service Project Internship of 08 weeks duration during summer vacation							

I Semester

Course Title	LINEAR ALGEBRA & CALCULUS				B. Tech. I Sem. (Common to All Branches)		
Course Code	**Category**	**Hours/Week**		**Credits**	**Maximum Marks**		
2321101	**BS&H**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	0	3	30	70	100
Mid Exam Duration : 2Hrs					**End Exam Duration : 3 Hrs.**		

Course Objectives:

- To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

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

CO1	Develop and use of matrix algebra techniques that are needed by engineers for practical applications.
CO2	Utilize mean value theorems to real life problems.
CO3	Familiarize with functions of several variables which are useful in optimization.
CO4	Learn important tools of calculus in higher dimensions.
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.

UNIT I: Matrices

Rank of a matrix by echelon form, normal form, **normal form in PAQ**. Cauchy–Binet formula (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: **Consistency and inconsistency of system of equations,** solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method. **Iterative Methods**: Jacobi and Gauss Seidel Iteration Methods.

UNIT II: Eigenvalues, Eigenvectors and Orthogonal Transformation

Eigenvalues, 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, Nature, **Signature and Index** of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT III: Calculus

Basic concepts of Calculus. 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)

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 two variables, method of Lagrange multipliers.

UNIT V: Multiple Integrals (Multi variable Calculus)

Double integrals: **Evaluation of double integrals in cartesian and polar coordinate**s, 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).

Text Books:

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

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).
6. A Text Book of Engineering Mathematics, N.P. Bali and Manish Goyal, Lakshmi Publications, Reprint 2008.

Course Title	CHEMISTRY				B. Tech. I Sem. EEE, CSE & AIML		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2323102	**BS&H**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	0	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods, molecular machines and switches.

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

CO1	Explain Schrodinger Wave equation & energy level diagrams of homo and heteronuclear diatomic molecules
CO2	Apply the principle of Band diagrams in the application of Semiconductors, superconductors and explain the importance of supercapacitors & nanomaterials.
CO3	Compare the materials of construction for battery and electrochemical sensors
CO4	Explain the preparation, properties, and applications of thermoplastics & thermosetting & elastomers conducting polymers
CO5	Explain the principles of spectrometry & chromatography and its applications

UNIT I : Structure and Bonding Models:

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2, particle in one dimensional box, **Differences between atomic & molecular orbitals**, molecular orbital theory –bonding in homo- and heteronucleardiatomic molecules – energy level diagrams of O_2 , $\mathbf{N_2}$ and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.

UNIT II : Modern Engineering materials

Semiconductors – Introduction, basic concept, **Types-Intrinsic & Extrinsic Semiconductors**, application.
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

Electrochemical cell, Nernst equation, **Reference Electrodes-Primary & Secondary Reference Electrodes**, 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, **Lead acid battery**- 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

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

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., **Gas Chromatography- Principle, Instrumentation and Applications**

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.
3. A Text book of Engineering chemistry by Shashi Chawla, Dhanpat Rai & Co publications

Reference Books:

1. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.D. Lee, Concise Inorganic Chemistry, 5th Edition, Wiley Publications, Feb.2008
3. Text book of Polymer Science, Fred W. Billmayer Jr, 3rd Edition
4. Principles of Instrumental Analysis,6th edition, Douglas A. Skoog, Cengage Publications.
5. Advanced Inorganic Chemistry, Cotton F Albert, Wilkinson Geoffrey, Prism Publications
6. An Introduction to Electrochemistry, Glasstone, Arihant Publications

Course Title	BASIC CIVIL AND MECHANICAL ENGINEERING				B. Tech. I Sem. EEE, CSE & AIML		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
23CM105	**Engineering Science**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	0	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

- Get familiarized with the scope and importance of Civil and Mechanical Engineering in different sectors and industries.
- Introduce the preliminary concepts of Building Planning, Building Construction, Materials and the related tests.
- Acquire preliminary knowledge of surveying and understand the importance of the quality of the drinking water.
- Explain different engineering materials and manufacturing processes.
- Provide an overview of different thermal and mechanical systems; introduce basics of robotics and its applications.

Course Outcomes: On completion of the course, the student should be able to

CO1	Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society. Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.
CO2	Realize the importance of Transportation in nation's economy and the engineering measures related to highways in terms of geometrics.
CO3	Understand the importance of water resources and storage structures so that the social responsibilities of water conservation will be appreciated. Understand the different manufacturing processes and explain the basics of thermal engineering and its applications.
CO4	Describe the working of different mechanical and power plants; learn basics of robotics.
CO5	Analyze various power transmission systems applications.

PART A: BASIC CIVIL ENGINEERING

UNIT I

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering - Hydraulics and Water Resources Engineering - Environmental Engineering -Scope of each discipline - Building Construction and Planning- Construction Materials-Cement – Aggregate Bricks - Cement concrete- Steel-Tests on these materials.

Factors to be considered in Building Planning- Nature of Buildings- Typical Layouts of a Residential Building- Industrial Building- Commercial Building like a Supermarket / Hotel / Theatre.

UNIT II

Surveying: Objectives of Surveying- Horizontal Measurements- Vertical Measurements- Angular Measurements- Leveling instruments used for leveling- Introduction to Bearings- Simple problems on leveling and bearings-Contour mapping.

UNIT III

Transportation Engineering, Water Resources and Environmental Engineering: Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences - Basic geometric design elements of a highway- Camber- Stopping Sight Distance- Super elevation- Introduction.

Water Resources and Environmental Engineering: Sources of water- Quality of water- Specifications and Tests- Introduction to Hydrology- Hydrograph –Rain water Harvesting- Rain water runoff- Water Storage Structures (Simple introduction to Dams and Reservoirs).

Text Books:

1. G. Shanmugam and M.S. Palanisamy, Basic Civil and the Mechanical Engineering, TataMcGraw Hill publications (India) Pvt. Ltd.
2. Basic Civil Engineering, S.S. Bhavikatti, New Age International Publishers.
3. Engineering Materials, Dr. S.C. Rangwala, Charotor Publishing House.
4. Highway Engineering, S.K. Khanna, C.E.G. Justo and Veeraraghavan, Nemchand andBrothers Publications.
5. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi.
6. Building Construction, Dr. B. C. Punmia, Lakshmi Publications, Delhi.

Reference Books:

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, KhannaPublishers, Delhi.

PART B: BASIC MECHANICAL ENGINEERING

UNIT I:

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT II

Manufacturing Processes: Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components ofElectric and Hybrid Vehicles.

UNIT III

Power plants – working principle of Steam, Diesel, Hydro, Nuclear power plants. **Mechanical Power Transmission -** Belt Drives, Chain, Rope drives, Gear Drives and theirapplications.
Introduction to Robotics - Joints & links, configurations, and applications of robotics.

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

Text Books:

1. Internal Combustion Engines by V. Ganesan, By Tata McGraw Hill publications (India) Pvt.Ltd.
2. A Text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications,(India) Pvt. Ltd.
3. An introduction to Mechanical Engineering by Jonathan Wicker and Kemper Lewis, Cengage Learning India Pvt. Ltd.

Reference Books:

1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I.
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak MPandey, Springer publications.
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt.Ltd.
4. G. Shanmugam and M.S. Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.

Course Title	INTRODUCTION TO PROGRAMMING				B. Tech. I Sem. EEE, CSE & AIML			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2305107	**Engineering Science**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	0	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

Course Outcomes: A student after completion of the course will be able to

CO1	Understand basics of computers, the concept of algorithm and algorithmic thinking.
CO2	Analyse a problem and develop an algorithm to solve it.
CO3	Implement various algorithms using the C programming language.
CO4	Understand more advanced features of C language.
CO5	Develop problem-solving skills and the ability to debug and optimize the code.

UNIT I : Introduction to Programming and Problem Solving

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Program Development Life Cycle,Basics of a Computer Program Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, 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 II : Control Structures
Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, dowhile) Break and Continue. Go to statement, Nested Loops.

UNIT III : Arrays and Strings
Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings. String handling functions, and Command line arguments.

UNIT IV : Pointers & User Defined Data types
Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, Dynamic Memory Allocation, Storage classes – auto, register, static, extern.

User-defined data types-Structures and Unions.

UNIT V : Functions & File Handling

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, Parameter Passing techniques, Recursion, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling.

Note: The syllabus is designed with C Language as the fundamental language of implementation.

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
3. Computer Science: A Structured Programming Approach Using C 3rd Edition by Behrouz A. Forouzan, Richard F. Gilberg)

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.

Course Title	IT WORKSHOP				B. Tech. I Sem. EEE, CSE & AIML		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2305109	**Engineering Science**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		0	0	2	1	30	70	100
					End Exam Duration: 3Hrs			

Course Objectives:

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

Course Outcomes:

CO1	Perform Hardware troubleshooting.
CO2	Understand Hardware components and inter dependencies.
CO3	Safeguard computer systems from viruses/worms.
CO4	Document/ Presentation preparation.
CO5	Perform calculations using spreadsheets.

PC Hardware & Software Installation

Task 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.

Task 2: 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.

Task 3: Student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: 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.

Task 5: 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

Task1: 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 are no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

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

Task 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.

Task 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

Task 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 TeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 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.

Task 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.

Task 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.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: 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

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT

Task 1: 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.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

ADOBE PHOTOSHOP

Task 1: Scanning images, editing their resolution and size, learning about bitmap and vector images, creating new images, and placing files are the basic concepts that are covered here.

Task 2: The students learn about the colour modes, colour management, colour mode conversion, colour picker functions, etc., in this module.

Task 3: An exposure to painting tools, brush tools, pencils, erasers, magic erasers, blending modes, etc.

AI TOOLS – ChatGPT

Task 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?"

Task 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."

Task 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?'"

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

Course Title	CHEMISTRY LAB				B. Tech. I Sem. EEE, CSE & AIML		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2323111	**BS & H**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End lab Exams**	**Total**
		0	**0**	**2**	**1**	30	70	100
					End Exam Duration: 3Hrs			

Course Objectives:

- To verify the fundamental concepts with experiments.
- The student will have exposure to various experimental skills and hand-on experience which is very essential for an Engineering student.

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

CO1	Determine the cell constant, redox potentials and conductance of solutions.
CO2	Prepare advanced polymer Bakelite materials
CO3	Measure the strength of an acid present in secondary batteries & copper in given sample
CO4	Analyse the IR spectra of some organic compounds & verify Beer Lamberts law
CO5	Calculate different parameters in water sample

Note: In the following list, out of 13 experiments, any 10 experiments must be performed in a Semester

List of Experiments:

1. Measurement of 10Dq by spectrophotometric method
2. Conductometric titration of strong acid vs. strong base
3. Conductometric titration of weak acid vs. strong base
4. Determination of cell constant and conductance of solutions
5. Potentiometry - determination of redox potentials and emfs
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of a Bakelite
8. Verify Lambert-Beer's law
9. Wavelength measurement of sample through UV-Visible Spectroscopy
10. Identification of simple organic compounds by IR
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry.
13. **Estimation of Hardness of Water by EDTA Method**
14. **Determination of Dissolved Oxygen present in Water sample by Winkler's method.**
15. **Estimation of Copper by EDTA Method**
16. **Determine the strength of chlorides present in water sample by $AgNo_3$ solution**

Text Books:

1. Vogel's Text book of Quantitative Chemical Analysis, J. Mendham et.al., Pearson Education, Sixth Edition, 2012.

2. Laboratory manual on Engineering Chemistry, Anupama Rajput, Dhanpat Rai & Co Publications.
3. Essentials of Experimental Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co Publications.

Reference Books:

1. Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
2. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.
3. Essentials of Physical Chemistry, Bhal& Tuli. (S. Chand Publications).
4. Advanced Inorganic Analysis, Agarwal &Keemtilal (Pragati prakashan)

Course Title	Engineering Workshop				B. Tech. I Sem. EEE, CSE & AIML		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2303112	**BS&H**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End lab Exams**	**Total**
		0	**0**	**3**	**1.5**	30	70	100
						End Exam Duration: 3Hrs		

Course Objectives:

- To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Course Outcomes:

CO1	Identify workshop tools and their operational capabilities.
CO2	Practice on manufacturing of components using workshop trades including fitting, carpentry,and foundry and welding
CO3	Apply fitting operations in various applications.
CO4	Apply basic electrical engineering knowledge for House Wiring Practice
CO5	

1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in woodworking and make following joints.
   (a) Half – Lap joint (b) Mortise and Tenon joint
   (c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metalworking, Developments of following sheet metal job from GI sheets.
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   (a) V-fit (b) Dovetail fit
   (c) Semi-circular fit
   (d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.
   (a) Paralleland series (b) Two-way switch
   (c) Godown lighting (d) Tube light
   (e) Three phase motor (f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation ofGreen Sand Moulds for given Patterns.
7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

Text Books:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

Course Title	Computer Programming Lab				B. Tech. I Sem. EEE, CSE & AIML			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2305113	**Engineering Sciences**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End lab Exams**	**Total**
		0	**0**	**3**	**1.5**	30	70	100
						End Exam Duration: 3Hrs		

Course Objectives:

- The course aims to give students hands – on experience and train them on the concepts of the C-programming language

Course Outcomes:	
CO1	Read, understand, and trace the execution of programs written in C language.
CO2	Select the right control structure for solving the problem.
CO3	Develop C programs which utilize memory efficiently using programming constructs.
CO4	Develop, Debug and Execute programs to demonstrate the applications of arrays and functions.
CO5	Develop, Debug and Execute programs to demonstrate the applications of basic concepts of pointers and Structures in C

UNIT I

WEEK 1

Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

i) Basic Linux environment and its editors like Vi, Vim & Emacs etc., **MS-DOS Environment and its commands.**

ii) Exposure to Turbo C, gcc

iii) Writing simple programs using printf(), scanf()

WEEK 2

Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 1: 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

iv) Finding area of circle

WEEK 3

Objective: Learn how to define variables with the desired data-type, initialize them with

appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 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
v) Find out $e=mc^2$

UNIT II

WEEK 4

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4: 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

Objective: Explore the full scope of different variants of "if construct" namely if-else, nullelse, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 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.
vi) Write a C program to find out the given number is even or odd.
vii) Write a C program to find out the given phone number is valid or not.
viii) Write a C program to find out the given number is positive or negative.

WEEK 6

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 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.
vi) Find out sum of individual digits of a given positive integer
vii) Find out the given number is strong number or not.

UNIT III

WEEK 7:

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 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.
vi) Find out smallest and biggest element in an 1D Float Array.
vii) Count frequency of each element.

WEEK 8:

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 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
vi) String palindrome or not

UNIT IV

WEEK 9:

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list

iv) Read student name and marks from the command line and display the student details along
with the total.
v) Write a C program to implement realloc()
vi) C program to calculate employee gross salary using structures

WEEK 10:

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures
Suggested Experiments/Activities:
Tutorial 10: Bitfields, Self-Referential Structures, Linked lists

Lab10 : Bitfields, linked lists
Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bitfields.
iv) Write a C program to copy one structure variable to another structure of the same type.
v) Demonstrate nested structures using a C program.

UNIT V

WEEK 11:

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration
Suggested Experiments/Activities:
Tutorial 11: Functions, call by value, scope and extent,
Lab 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:

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.
Suggested Experiments/Activities:
Tutorial 12: Recursion, the structure of recursive calls
Lab 12: Recursive functions

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the lcm of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.
vi) Write a program in C to calculate the sum of numbers from 1 to n using recursion

WEEK 13:

Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

i) Write a C program to swap two numbers using call by reference.

ii) Demonstrate Dangling pointer problem using a C program.

iii) Write a C program to copy one string into another using pointer.

iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

WEEK14:

Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 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 file using command-line arguments.

v) Find no. of lines, words and characters in a file

vi) Write a C program to print last n characters of a given file.

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

Course Title	HEALTH AND WELLNESS, YOGA AND SPORTS				B. Tech. I Sem. EEE, CSE & AIML			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2306117	BS&H	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	1	0.5			
					6 X 15 = 90 + 10 Viva voce			

Course Objectives:

- The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

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

CO1	Understand the importance of yoga and sports for Physical fitness and sound health.
CO2	Demonstrate an understanding of health-related fitness components.
CO3	Compare and contrast various activities that help enhance their health.
CO4	Assess current personal fitness levels.
CO5	Develop Positive Personality.

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:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) 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:

i) 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
ii) Practicing cardiorespiratory 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 SurvivingAnywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. HumanKinetics, 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 manyas Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- 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, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva-voce on the subject.

II Semester

Course Title	Differential Equations and Vector Calculus				B. Tech. II Sem. (Common to All Branches)		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2321201	**BS&H**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	0	3	30	70	100
Mid Exam Duration: 2 Hrs					**End Exam Duration: 3 Hours**		

Course Objectives:

- To enlighten the learners in the concept of differential equations and Multi Variable Calculus.
- 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

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

CO1	Solve the first order differential equations related to various engineering fields.
CO2	Solve the second and higher differential equations related to various engineering fields.
CO3	Identify solution methods for partial differential equations that model physicalprocesses.
CO4	Interpret the physical meaning of different operators such as gradient, curl and divergence.
CO5	Estimate the work done against a field, circulation and flux using vector calculus.

UNIT I: Differential equations of first order and first degree

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)

Definitions, homogenous and non-homogenous, complementary function, general solution, particular integral **of the type e^{ax}, sinax, cosax, polynomials in x, e^{ax} V(x), x^nV(x)** , Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to **L-R Circuit** and L-C-R Circuit problems and Simple Harmonic motion.

UNIT III: Partial Differential Equations

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. Homogeneous Linear Partial differential equations with constant coefficients.

UNIT IV: Vector differentiation

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

UNIT V: Vector integration

Line integral-circulation-work done - **Scalar Potential**, 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.

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.

Reference 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
6. A Text Book of Engineering Mathematics, N.P. Bali and Manish Goyal, Lakshmi Publications, Reprint 2008.

Course Title	COMMUNICATIVE ENGLISH				B. Tech. II Sem. EEE, CSE & AIML			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2324201	**BS&H**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		2	0	0	2	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

COURSE OBJECTIVES	
1	Facilitate effective listening, Reading, Speaking and Writing skills among the students
2	Enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary
3	Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing
4	Helps the students to make them effective in speaking and writing skills and to make them industry ready.
5	Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
COURSE OUTCOMES	
CO1	**Understand** the context, topic, and pieces of specific information from social or transactional dialogues.
CO2	**Apply** grammatical structures to formulate sentences and correct word forms.
CO3	**Analyze** discourse markers to speak clearly on a specific topic in informal discussions
CO4	**Evaluate** reading / listening texts and to write summaries based on global comprehension of these texts.
CO5	**Create** a coherent paragraph, essay, and resume.

UNIT I

Lesson : **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 topics such as home, family, work, studies and interests; introducing oneself 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, Spellings, Punctuation-Parts of Sentences.
Grammar : Parts of Speech, Basic Sentence Structures-forming questions
Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words, **One word Substitutes.**

UNIT II

Lesson : **NATURE:** The Brook by Alfred Tennyson (Poem)
Listening : Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
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, **Idioms and Phrases.**

UNIT III

Lesson : **BIOGRAPHY:** Elon Musk
Listening : Listening for global comprehension and summarizing what is listened to.
Speaking : Discussing specific topics in pairs or small groups and reporting what is discussed
Reading : Reading a text in detail by 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, **Question Tags**
Vocabulary: Compound words, Collocations

UNIT IV

Lesson : **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 and **Technical Report Writing**
Grammar : Reporting verbs, Direct & Indirect speech, Active & Passive Voice
Vocabulary: Words often confused, Jargons

UNIT V

Lesson : **MOTIVATION**: The Power of Intrapersonal Communication (An Essay)
Listening : Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking : Formal oral presentations on topics from academic contexts
Reading : Reading comprehension.
Writing : Writing structured essays on specific topics.
Grammar : Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement) **Graphic Presentation**
Vocabulary: Technical Jargons

Text Books:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

Reference Books:

1. Raman, Meenakshi and Sangeeta Sharma, 2011. Technical Communication: Principlesand Practice. Second Edition. New Delhi: Oxford University Press.
2. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020

3. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
4. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
5. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Web Resources:

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

Course Title	Electrical Circuit Analysis - 1					B. Tech. EEE (II Sem.)		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2302202	**PC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	0	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

- To develop an understanding of the fundamental laws, elements of electrical circuitsand to apply circuit analysis to DC and AC circuits.

Course Outcomes:

CO1	Remembering the basic electrical elements and different fundamental laws.
CO2	Understand the network reduction techniques, transformations, concept of self-inductance and mutual inductance, phasor diagrams, resonance and network theorems.
CO3	Apply the concepts to obtain various mathematical and graphicalrepresentations.
CO4	Analyse nodal and mesh networks, series and parallel circuits, steady state response, different circuit topologies (with R, L and C components).
CO5	Evaluation of Network theorems, electrical, magnetic and single-phase circuits.

UNIT I : INTRODUCTION TO ELECTRICAL CIRCUITS

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources, node and mesh analysis.

UNIT II : MAGNETIC CIRCUITS

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 III : SINGLE PHASE CIRCUITS

Characteristics of periodic functions, Average value, R.M.S. value, form factor, representation of a sine function, concept of phasor, phasor diagrams, node and mesh analysis. Steady state analysis of R, L and C circuits to sinusoidal excitations-response of pure resistance, inductance, capacitance, series RL circuit, series RC circuit, series RLC circuit, parallel RL circuit, parallelRC circuit.

UNIT IV : RESONANCE AND LOCUS DIAGRAMS

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

UNIT V : NETWORK THEOREMS (DC & AC EXCITATIONS)

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem

Text Books:

1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, TataMcGraw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised ThirdEdition

Reference Books:

1. Fundamentals of Electrical Circuits, Charles K. Alexander and Mathew N.O. Sadiku,McGraw Hill Education (India), 2013, Fifth Edition
2. Electric Circuits (Schaum's outline Series), Mahmood Nahvi, Joseph Edminister, and K. Rao, Mc Graw Hill Education, 2017, Fifth Edition.
3. Electric Circuits, David A. Bell, Oxford University Press, 2009, Seventh Edition.
4. Introductory Circuit Analysis, Robert L Boylestad, Pearson Publications, 2023,Fourteenth Edition.
5. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai & Co., 2018,Seventh Revised Edition.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc23_ee81/preview
2. https://nptel.ac.in/courses/108104139
3. https://nptel.ac.in/courses/108106172
4. https://nptel.ac.in/courses/117106108

Course Title	ENGINEERING PHYSICS				B. Tech. II Sem. *EEE, CSE & AIML*		
Course Code	**Category**	**Hours/Week**		**Credits**	**Maximum Marks**		
2322204	**BS&H**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	**0**	**0**	**3**	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**		

Course Objectives:

- To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc,
- Enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics.
- Introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

Course Outcomes:

CO1	Analyze the intensity variation of light due to interference, diffraction and polarization
CO2	Familiarize with the basics of crystals and their structures
CO3	Summarize various types of polarization of dielectrics and classify the magnetic materials.
CO4	Explain fundamentals of quantum mechanics and apply to one dimensional motion of particles.
CO5	Identify the type of semiconductor using Hall Effect.

UNIT I : Wave Optics

Interference: Introduction- Principle of superposition –Interference of light –**Conditions for sustained Interference**-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 & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative)- **Engineering applications of diffraction.**

Polarization: Introduction-Types of polarization- Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates- **Engineering applications of polarization.**

UNIT II : Crystallography and X-ray diffraction

Crystallography: Introduction - 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: Introduction - Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods- **applications**.

UNIT III : Dielectric and Magnetic Materials

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- **applications.**

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 Ferro magnetism &Domain walls (Qualitative)-Hysteresis-soft and hard magnetic materials- **applications.**

UNIT IV : Quantum Mechanics and Free electron theory

Quantum Mechanics: Introduction – 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- **applications**.

Free Electron Theory: Introduction - 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

Semiconductors: Introduction - 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–**Direct and indirect band gap of semiconductors-**Hall effect and its applications-**Formation of p-n junction.**

Text Books:

1. A Text book of Engineering Physics - M.N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition2019.
2. Engineering Physics-D.K. Bhattacharya and Poonam Tandon, Oxford press (2015).

Reference Books:

1. Engineering Physics - B.K. Pandey and S.Chaturvedi, Cengage Learning
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education,2018.
3. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

Course Title	Basic Electrical & Electronics Engineering				B. Tech. II Sem. *EEE, CSE & AIML*		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
23EE206	**Engineering Science**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	0	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives:

- To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

Course Outcomes: O\After the completion of this course students will be able to

CO1	Remember the fundamental laws, operating principles of motors, generators, MC and MI instruments.
CO2	Understand the problem solving concepts associated to AC and DC circuits, construction and operation of AC and DC machines, measuring instruments; different power generation mechanisms, Electricity billing concept and important safety measures related to electrical operations.
CO3	Apply mathematical tools and fundamental concepts to derive various equations related to machines, circuits and measuring instruments; electricity bill calculations and layout representation of electrical power systems.
CO4	Analyze different electrical circuits, performance of machines and measuring instruments.
CO5	Evaluate different circuit configurations, Machine performance and Power systems operation.

PART A: BASIC ELECTRICAL ENGINEERING

UNIT I : 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, phase difference, average value, RMS value, form factor, peakfactor, 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 II : 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 and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

UNIT III : Energy Resources, Electricity Bill & Safety Measures

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

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.

Text 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, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:	
➢ To understand the principles of digital electronics, basics of semiconductor devices like diodes & transistors, characteristics and its applications.	
Course Outcomes: On successful completion of this course, the students will be able to	
CO1	Understand the working mechanism of diodes, transistors, logic gates, different combinational, sequential circuits and their role in the digital systems.
CO2	Apply diodes, transistors in the electronic circuits and number systems, logic gates, Boolean algebra in logic circuits.
CO3	Analyze the circuits with diodes, transistors and logic circuits with logic gates.

UNIT I : SEMI CONDUCTOR 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 II : 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 III : DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3code, 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)

Text Books:

1. R.L. Boylestad &Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education,2021.
2. R. P. Jain, Modern Digital Electronics, 4thEdition, Tata McGraw Hill, 2009

Reference Books:

1. R.S. Sedha, A Text book of Electronic Devices and Circuits, S. Chand & Co,2010.
2. Santiram Kal, Basic Electronics-Devices, Circuits and IT Fundamentals, Prentice Hall, India,2002.
3. R.T. Paynter, Introductory Electronic

Course Title	Engineering Graphics				B. Tech. II Sem. *EEE, CSE & AIML*			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2303208	**Engineering Science**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		1	0	4	3	30	70	100
Mid Exam Duration: 2Hrs					**End Exam Duration: 3Hrs**			

Course Objectives: The students completing the course are expected to:

- Understand the basic principles and conventions of engineering drawing use engineering instruments and draw engineering curves.
- Use orthographic projections and make the students draw the projections of lines and planes inclined to both the planes.
- Draw the projections of the solids in different positions with respect to the reference planes.
- Understand the importance of sectioning and concept of development of surfaces.
- Represent and convert isometric views to orthographic views and vice versa.

Course Outcomes: On completion of the course, the student should be able to

CO1	Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.
CO2	Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.
CO3	Apply concepts of sectional views to represent details of solids in simple positions.
CO4	Gain a clear understanding of the principles behind development of surfaces and to understand how to unfold basic geometric shapes into flat patterns.
CO5	Develop the ability to draw isometric views and orthographic views and should be able to convert isometric views to orthographic views and vice versa.

UNIT I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola and hyperbola by general, Cycloids, Involutes, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight 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. Projections of Straight Line Inclined to both the reference planes

Projections of Planes: regular 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 III

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: 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 other and axes inclined to both the reference planes.

UNIT IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end Examination*).

Text Books:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.
2. K. Vengopal Engineering Drawing & Graphics.2018
3. Harwinder Singh Engineering Drawing & Computer Graphics.2016

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe,Tata McGraw Hill, 2017.

5. https://nptel.ac.in/courses/117106108

Course Title	Electrical Circuits Lab				B. Tech. EEE (II Sem.)			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2302203	PC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	30	70	100
					End Exam Duration: 3Hrs			

Course Objectives:

- To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics. It also gives practical exposure to the usage of different circuits with different conditions.

Course Outcomes:

CO1	Understand the concepts of network theorems, node and mesh networks, series and parallel resonance and Locus diagrams
CO2	Apply various theorems to compare practical results obtained with theoretical calculations.
CO3	Determine self, mutual inductances and coefficient of coupling values, parameters of choke coil.
CO4	Analyse different circuit characteristics with the help of fundamental laws and various configurations.
CO5	Create locus diagrams of RL, RC series circuits and examine series and parallel resonance.

List of Experiments:

1. Verification of Kirchhoff's circuit laws.
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

Reference Books:

1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, TataMcGraw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised ThirdEdition

Course Title	COMMUNICATIVE ENGLISH LAB				B. Tech. II Sem. EEE, CSE & AIML		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2324210	**BS&H**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		0	0	2	1	30	70	100
					End Exam Duration: 3Hrs		

Course Objectives

- Students will be exposed to a variety of self-instructional, learner friendly modes of language learning.
- The students will get trained in basic communication skills and also make them ready to face job interviews.
- Students will learn better pronunciation through stress, intonation and rhythm.
- Students will be initiated into greater use of the computer in resume preparation, report writing, format making etc.

Course Outcomes

CO1	**Understand** the different aspects of the English language proficiency with emphasis on LSRW skills.
CO2	**Apply** communication skills through various language learning activities.
CO3	**Analyze** the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
CO4	**Evaluate** and exhibit professionalism in participating in debates and group discussions.
CO5	**Create** effective Course Objectives:

List of Topics:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
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
11. Listening Skills
12. Describing Objects

Suggested Software:

- Walden Infotech
- Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press.2018.
2. Taylor Grant: *English Conversation Practice*, Tata McGraw-Hill Education India, 2016
3. Hewing's, Martin. Cambridge *Academic English* (B2). CUP, 2012.
4. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2nd Ed) , Kindle, 2013

Web Resources:

Spoken English:

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

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

Course Title	Electrical & Electronics Engineering Workshop				B. Tech. II Sem. *EEE, CSE & AIML*			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23EE214	**Engineering Science**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		0	0	3	1.5	30	70	100
					End Exam Duration: 3Hrs			

Course Objectives:

To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

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

CO1	Identify &testing of various electronic components.
CO2	Understand the usage of electronic measuring instruments.
CO3	Plot and discuss the characteristics of various electronic devices.
CO4	Explain the operation of a digital circuit.

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Breadboard, 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 hard ware 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, IC set, Comparevalues of components like resistors, inductors, capacitors etc with the measured values byusing instruments.

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of 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
8. OC and SC tests on single phase transformer
9. Brake test on DC Shunt Motor

PARTB: ELECTRONICS ENGINEERING LAB

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, Multimeters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

Reference Books:

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

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

Course Title	ENGINEERING PHYSICS LAB				B. Tech. II Sem. EEE, CSE & AIML		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2322215	**BSC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		0	**0**	**2**	**1**	30	70	100
					End Exam Duration: 3Hrs		

Course Objectives:

- To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

Course Outcomes:

CO1	Operate optical instruments like travelling microscope and spectrometer.
CO2	Estimate the wavelengths of different colors using diffraction grating.
CO3	Plot the intensity of the magnetic field of circular coil carrying current with distance.
CO4	Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.
CO5	Calculate the band gap of a given semiconductor. Identify the type of semiconductor using Hall Effect.

List of Experiments:

1. Determination of radius of curvature of a given Plano convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using Diffraction grating in normal incidence on figuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photo electric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non- uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.
19. Fraunhoffer diffraction due to single slit.

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

Text Books:

1. A Text book of Practical Physics-S.Balasubramanian, M.N.Srinivasan, S.Chand Publishers, 2017.
2. Practical Physics by K.Venugopalan (Author), Vimal Saraswat (Author), Himanshu Publications (1 January 2018)

Reference Books:

1. Lab manual Physics, R Rangarajan, R P Manchanda, R K Gupta, Rajesh Kumar Neena Sinha-New Saraswati House.
2. Practical Physics by Kumar P. R. Sasi, Prentice-Hall of India Pvt. Ltd

URL:*www.vlab.co.in*

Course Title	NSS / NCC / SCOUTS & GUIDES / COMMUNITY SERVICE				B. Tech. II Sem. EEE, CSE & AIML			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2306216	**BS&H**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		0	0	1	0.5			
					6 X 15 = 90 + 10 Viva voce			

Course Objectives:

- The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

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

CO1	Understand the importance of discipline, character and service motto.
CO2	Solve some societal issues by applying acquired knowledge, facts, and techniques.
CO3	Explore human relationships by analyzing social problems.
CO4	Determine to extend their help for the fellow beings and downtrodden people.
CO5	Develop leadership skills and civic responsibilities.

UNIT I : Orientation

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

Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talentsand skills
ii) Conducting orientations programs for the students –future plans-activities-releasing roadmap etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II : Nature & Care Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organizing Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT III : Community Service Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Surveyin the village, identification of problems- helping them to solve via media- authorities-experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.

v) Any other programmes 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, DirectorateGeneral of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering",McGrawHill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to EnvironmentalEngineering 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:

- Evaluated for a total of 100 marks.
- 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, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting vivavoce on the subject.

III Semester

COMPLEX VARIABLES AND NUMERICAL METHODS								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23HS304	**Basic Sciences (BS)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		3	0	--	3	30	70	100
Mid Exam Duration: 2 Hrs						**Sem.-End Exam Duration: 3 Hrs**		
Pre-Requisites:								
Course Objectives: CEO1. The concepts of complex variables to equip the students to solve application problems. CEO2. Impart with numerical methods of solving the non-linear equations and interpolation. CEO3. Solve differential and integral equations numerically.								
Course Outcomes: On successful completion of this course, the students will be able to **CO1.** Determine the differentiation of complex functions used in engineering problems and construction of analytic functions. **CO2.** Determine complex integration along the path and apply Residue theorem. **CO3.** Apply numerical methods to solve algebraic and transcendental equations. **CO4.** Derive interpolating polynomials using interpolation formulae. **CO5.** Solve differential and integral equations numerically.								

UNIT-I: Complex Variables – Differentiation

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 Variables – Integration

Line integral-Contour integration, Cauchy's integral theorem (Simple Case), Cauchy Integral formula, zeros of analytic functions, singularities, Pole, Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine.

UNIT-III: Solution of Algebraic & Transcendental Equations

Introduction-Bisection Method, Iterative method, Regula-falsi method and Newton Raphson Method

UNIT-IV: Interpolation

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae, Inverse interpolation.

UNIT-V: Solution of Initial value problems to Ordinary differential equations

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).

TEXT BOOKS:

1. Higher Engineering Mathematics, Dr. B.S Grewal, Khanna Publishers-44 edition, 2017.
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. Higher Engineering Mathematics, B.V.Ramana, Mc.Graw Hill Education (India) Private Limited.
3. H. K Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand Publications,2014, Third Edition 2021
4. Advanced Engineering Mathematics by N. Bali, M Goyal & C.Watkins Firewall Media 17th edition Reprint 2015.

ADDITIONAL LEARNING RESOURCES:

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.

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (Common to AIML, CE, CSE, ECE, EEE, ME)								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23HS321	**Humanities, Social Science and Management Course (HSMC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		2	0	0	2	30	70	100
Mid Exam Duration: 2 Hrs						**Sem.-End Exam Duration: 3 Hrs**		
Pre-Requisites:								

Course Objectives:

- **CEO1.** To inculcate the basic knowledge of microeconomics and financial accounting.
- **CEO2.** To make the students learn how demand is estimated for different products, input- output relationship for optimizing production and cost minimization.
- **CEO3.** To Know the Various types of market structure and pricing methods and strategy.
- **CEO4.** To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- **CEO5.** To provide fundamental knowledge on accounting and to explain the process of preparing financial statement.

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

CO1. Define the concepts related to Managerial Economics, financial accounting and management.

CO2. Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets.

CO3. Apply the Concept of Production cost and revenues for effective Business decision.

CO4. Analyzing and evaluating investment decisions using Capital budgeting techniques to maximize the returns.

CO5. Able to prepare financial statements and evaluate the financial performance of business firms

UNIT-I:

Introduction –Meaning, Nature and scope, significance. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Methods. Managerial Economics and Financial Accounting and Management.

UNIT-II:

Introduction – Nature, meaning, significance. Production Function with one variable and two variables– Least- cost combination– - Isoquants and Iso costs, Break-Even Analysis - Cost concepts - Determination of Break-Even Point (Simple Problems).

UNIT-III:

Capital Budgeting - Nature, meaning, significance, Features, Proposals, Methods and Evaluation of Projects – Pay Back period (PBP) Accounting Rate of Return (ARR), Net Present Value (NPV), Internal Rate of Return (IRR) Method and Profitability Index (P/I) (simple problems).

UNIT-IV:

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.

UNIT-V:

Introduction – Meaning, Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Financial Ratios – Types of Ratios.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Ahuja Hl Managerial economics, S. Chand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
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.

ADDITIONAL LEARNING RESOURCES:

1. https://www.slideshare.net/123ps/managerial-economics-ppt.
2. https://www.slideshare.net/rossanz/production-and-cost-45827016.
3. https://www.slideshare.net/darkyla/business-organizations-19917607.
4. https://www.slideshare.net/balarajbl/market-and-classification-of-market.

ELECTROMAGNETIC FIELD THEORY								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2302301	**Engineering Science (ESC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		3	0	0	3	30	70	100
Mid Exam Duration: 1.5 Hrs						**Sem.-End Exam Duration: 3 Hrs**		

Pre-Requisites:
Mathematics and Applied Physics

Course Objectives:
CEO1. To apply vector calculus and to introduce the concepts of electric field and magnetic fields.
CEO2. To know applications of electric and magnetic fields in the development of the theory for power transmission lines and electrical machines.
CEO3. To describe basic laws related to electromagnetic fields
CEO4. To describe the significance of Maxwell's Equations in Electromagnetic Phenomenon
CEO5. To discuss the concepts of Inductance and Capacitance

Course Outcomes: On successful completion of this course, the students will be able to
CO1. Apply the concepts of Vector analysis and evaluate the concepts of Electrostatics using Coulomb's law and
Gauss's law
CO2. Analyze the behaviour of conductors, dielectrics, capacitance
CO3. Evaluate the concepts of magnetostatics using Biot- Savart's law, Ampere's circuital law and determine force in magnetic fields
CO4. Determine self and mutual inductance, energy stored and energy density in a magnetic field.
CO5. Analyze Maxwell's equations for time varying electric and magnetic fields and Poynting theorem

UNIT I
Vector Analysis and Electrostatics
Coordinate Systems: Rectangular, Cylindrical and Spherical coordinate systems.
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, $\nabla . \bar{D} = \rho\_v$, 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 $\nabla \times \bar{E} = 0$), Potential gradient, Laplace's and Poisson's equations.

UNIT II
Conductors – Dielectrics and Capacitance
Behaviour 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, Behaviour of conductors in an electric field, Polarization, dielectric constant, 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.

UNIT III
Magnetostatics, Ampere's Law and Force in magnetic fields
Biot-Savart's law and its applications viz. Straight current carrying filament, circular and solenoid

current carrying wire – Magnetic flux density and Maxwell's second Equation ($\nabla.\bar{B} = 0$), Ampere's circuital law and its applications, Point form of Ampere's circuital law, Maxwell's third equation ($\nabla \times \bar{H} = \bar{J}$), Lorentz force equation, Force on a current element in a magnetic field, Force on a straight and long current carrying conductors in magnetic fields, the force between two and straight parallel current carrying conductors, Torque on a current loop placed in a magnetic dipole.

UNIT IV

Self and mutual inductance

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

Faraday's laws of electromagnetic induction, Maxwell's fourth equation ($\nabla \times \bar{E} = -(\partial\bar{B}/\partial t)$), 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.

Total Periods: 50

Textbooks:

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

Reference Books:

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

Web Resources:

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

SWITCHING THEORY AND LOGIC DESIGN								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2304304	**Engineering Science (ES)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		3	0	0	3	30	70	100
Mid Exam Duration: 2 Hrs						**Sem.-End Exam Duration: 3 Hrs**		

Pre-Requisites:

To study switching theory and logic design, students need a foundation in basic mathematics, electronics, physics, computer science fundamentals, and strong problem-solving skills.

Course Objectives:

CEO1. Understand the properties of Boolean algebra, logic operations, and minimization of Boolean functions.

CEO2. Analyze combinational and analyze sequential logic circuits.

CEO3. Model combinational and sequential circuits using HDLs.

COE4. Understand the concepts of FSM and compare various Programmable logic devices.

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

CO1. Understand the properties of Boolean algebra, logic operations, concepts of FSM. (L2)

CO2. Apply techniques for minimization of Boolean functions. (L3)

CO3. Analyze combinational and Sequential logic circuits. (L4)

CO4. Design and Model combinational and sequential circuits using HDLs. (L5, L6)

CO5. Compare various Programmable logic devices. (L4)

UNIT I

Boolean algebra: Number Systems and Codes, Representation of unsigned and signed integers, Floating Point representation of real numbers, Laws of Boolean Algebra, Theorems of Boolean Algebra, Realization of functions using logic gates, Canonical forms of Boolean Functions, Minimization of Functions using Karnaugh Maps.

UNIT II

Combinational Logic Circuits: Design with basic logic gates, design procedure, adders, subtractors, 4-bit binary adder/ subtractor circuit, BCD adder, carry look- a-head adder, binary multiplier, magnitude comparator, data selectors, priority encoders, decoders, multiplexers, demultiplexers.

UNIT III

Sequential Logic Circuits: Basic architectural distinction between combinational and sequential circuits, Design procedure, latches, flip-flops, truth tables and excitation tables, timing and triggering consideration, conversion of flip- flops, design of counters, ripple counters, synchronous counters, ring counter, Johnson counter, registers, shift registers, universal shift register.

UNIT IV

Finite State Machines and Programmable Logic Devices: Types of FSM, capabilities and limitations of FSM, state assignment, realization of FSM using flip-flops, Mealy to Moore conversion and vice-versa, reduction of state tables using partition technique, Design of sequence detector. Types of PLD's: PROM, PAL, PLA.

UNIT V

Hardware Description Language: Introduction to Verilog - structural specification of logic circuits, behavioural specification of logic circuits, hierarchical Verilog Code, Verilog for combinational circuits - conditional operator, if-else statement, case statement, for loop using storage elements with CAD tools-using Verilog constructs for storage elements, flip-flop with clear capability, using Verilog constructs for registers and counters.

TEXT BOOKS:

1. M. Morris Mano, "Digital Design", 3rd Edition, PHI. (Unit I, II, IV, V)
2. Stephen Brown and ZvonkoVranesic, "Fundamentals of Digital Logic with Verilog Design", 3rd Edition, McGraw-Hill (Unit III)

REFERENCE BOOKS:

1. Charles H. Roth, Jr, "Fundamentals of Logic Design", 4th Edition, Jaico Publishers.
2. ZviKohavi and NirajK.Jha, "Switching and Finite Automata Theory", 3rd Edition, Cambridge University Press, 2010.
3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", 2nd Edition, Prentice Hall PTR.
4. D.P. Leach, A.P. Malvino, "Digital Principles and Applications", TMH, 7th Edition.

ADDITIONAL LEARNING RESOURCES:

https://onlinecourses.swayam2.ac.in/nou24_ec07/preview
https://onlinecourses.nptel.ac.in/noc24_ee94/preview?user_email=msreddy@ksrmce.ac.in
https://www.geeksforgeeks.org/digital-electronics-logic-design-tutorials/)

ELECTRICAL CIRCUITS ANALYSIS-II								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2302302	**Professional Core (PC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		3	0	--	3	30	70	100
Mid Exam Duration: 2 Hrs						**Sem.-End Exam Duration: 3 Hrs**		
Pre-Requisites: Electrical Circuit Analysis-I								

Course Objectives:

CEO1. To Understand three phase balanced and unbalanced circuits ,measurement of active and reactive power.

CEO2. To Apply Laplace transforms to analyze R-L,R-C and R-L-C circuits for DC transient response

CEO3. To Understand impedance, admittance, hybrid, and transmission (ABCD) parameters will enable students to convert between different parameter forms and analyze networks for reciprocity and symmetry.

CEO4. To Understand single port and multiport networks, immittance functions derived from two-port parameters, constraints from pole-zero locations.

CEO5. Able to design different circuit configurations and it's mathematical modeling of various filters

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

CO1. Understand three phase balanced and unbalanced circuits ,measurement of active and reactive power.

CO2. Apply Laplace transforms to analyze R-L,R-C and R-L-C circuits for DC transient response

CO3. Understand single port and multiport networks, immittance functions derived from two-port parameters, constraints from pole-zero locations.

CO4. Understand impedance, admittance, hybrid, and transmission (ABCD) parameters will enable students to convert between different parameter forms and analyze networks for reciprocity and symmetry.

CO5. Design different circuit configurations and it's mathematical modeling of various filters

UNIT-I:

Analysis of three phase 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.
Analysis of three phase unbalanced circuits
Loop method, Star-Delta transformation technique, two-wattmeter method for measurement of three phase power.

UNIT-II:

Transient Analysis

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

UNIT-III:

Network Functions

Single port and multiport networks, immittance functions of two port parameters necessary conditions for driving point and transfer functions ,poles and zeros ,time domain response from pole zero plots, restrictions from pole zero locations.

UNIT-IV:

Network Parameter
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-V:
Filters
Classification of filters-Low pass, High pass, Band pass and Band Elimination filters, Constant-k filters -Low pass and High Pass, Design of Filters.

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, 3rd Edition, 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. KulshreshthaGopal G. Bhise, Prem R. Chadha ,Umesh Publications 2012.
5. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, DhanpatRai& Co., 2018, 7th Revised Edition.

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

DC MACHINES & TRANSFORMERS								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2302303	**Engineering Science (ESC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		3	0	0	3	30	70	100
Mid Exam Duration: 1.5 Hrs						**Sem.-End Exam Duration: 3 Hrs**		

Pre-Requisites: Understanding DC machines and transformers requires a foundational grasp of electromagnetism, basic circuit theory, mathematical concepts, material properties, and safety regulations.

Course Objectives:

CEO1: Gain a comprehensive understanding of the fundamental principles underlying DC machines and transformers, including electromagnetism and magnetic circuit analysis.

CEO2: Develop proficiency in analyzing and designing DC machines and transformers, emphasizing their construction, operation, and performance characteristics.

CEO3: Explore the theoretical aspects of transformer operation, including transformer types, efficiency, regulation and losses.

CEO4: Acquire practical skills in calculating and interpreting transformer and DC machine parameters using mathematical models and equations.

CEO5: Apply knowledge of safety regulations and standards relevant to the installation, maintenance, and operation of DC machines and transformers in electrical systems.

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

CO1. Understand the process of voltage build-up, characteristics, armature reaction, commutation and parallel operation of DC generators.

CO2. Understand the concept of back emf, process of torque buildup, starting and speed control of DC motors and illustrate their characteristics.

CO3. Understand the concept of losses, efficiency and testing of DC machines.

CO4. Obtain the equivalent circuit of single-phase transformer, operation on load and no load, determine its efficiency & regulation.

CO5. Analyze various testing methods for transformers, principle of auto transformer and various configurations of three-phase transformers.

UNIT-I: DC Generators

Construction and principle of operation of DC generator – EMF equation of DC generator – Excitation techniques– OCC, Internal & External Characteristics of Generators– Armature reaction and commutation, Parallel operation of DC generators, numerical problems.

Unit-II: DC Motors

D.C Motors: Back E.M.F, Torque Equation, characteristics and application of series, shunt and compound motors, Necessity of a starter – starting by 3-point and 4-point starters – speed control by armature voltage and field current control of DC motors, numerical problems

UNIT-III: Testing of DC Machines

Testing of DC Machines: Losses & efficiency, condition for maximum efficiency, brake test, Swinburne's test, Hopkinson's test, field's test, separation of stray losses in a dc motor, numerical problems.

UNIT-IV: Single-phase Transformers

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 – all day efficiency, numerical problems.

UNIT-V: Testing of Transformers

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

Three-Phase Transformers

Poly-phase connections- Y/Y, Y/Δ, Δ/Y, Δ/Δ –Scott connection.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

ADDITIONAL LEARNING RESOURCES:

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

Electrical Circuit Analysis and Simulation Lab								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2302351	**Engineering Science (ESC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		0	0	2	1	40	60	100

Pre-Requisites:
MATLAB/ MULTISIM

Course Objectives:
CEO1. To measure three phase voltages, current, active and reactive powers.
CEO2. To measure the basic Two Port Network Parameters.
CEO3. To analyze a given network by applying various network theorems using simulation tools
CEO4. To analyze the transient response of RL, RC and RLC circuits.

Course Outcomes: On successful completion of this course, the students will be able to
CO1. Understand the power calculations in three phase circuits.
CO2. Analyze the time response of given network.
CO3. Determination of two port network parameters.
CO4. Simulate and analyze electrical circuits using software tools
CO5. Apply various theorems to solve different electrical networks using simulation tools

List of Exercises/List of Experiments: Minimum Ten experiments are to be conducted.

1. Measurement of Active Power and Reactive Power for R-L Circuits.
2. Measurement of Active Power and Reactive Power for R-C Circuit.
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.

REFERENCE BOOKS/LABORATORY MANUALS: LABORATORY MANUAL

SOFTWARE/Tools used: MATLAB/OCTAVE/MULTISIM/ LT SPICE

DC MACHINES & TRANSFORMERS LAB								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2302352	**Professional Core (PC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		0	**0**	**3**	**1.5**	**30**	**70**	**100**

Pre-Requisites:
DC Machines & Transformers

Course Objectives:

CEO1. Develop practical skills in operating and analyzing the performance of DC motors, generators, and transformers.

CEO2. Understand the fundamental principles of electromechanical energy conversion and transformer operation.

CEO3. Gain proficiency in testing and evaluating the efficiency, voltage regulation, and impedance of transformers.

CEO4. Learn to interpret data from experiments to optimize the performance of DC machines and transformers.

CEO5. Prepare students for real-world applications in electrical engineering through hands-on laboratory experience.

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

CO1. Demonstrate Starting and speed control methods of DC Machines.

CO2. Apply theoretical concepts to determine the performance characteristics of DC Machines.

CO3. Analyze the parallel operation of single-phase transformers.

CO4. Determine the performance parameters of single-phase transformer.

CO5. Analyze the performance of transformers using various tests.

List of Exercises/List of Experiments: Minimum Ten 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 teston 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.

REFERENCE BOOKS/LABORATORY MANUALS:

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

PYTHON PROGRAMMING (Common to CSE, CSE (DS), AI&ML, CSE(AI&ML), ECE, EEE, ME)								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2305353	**Skill Enhancement Course**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		0	**1**	**2**	**2**	**30**	**70**	**100**

Pre-Requisites:
Programming in C Language.

Course Objectives:
CEO1. Introduce core programming concepts of Python programming language.
CEO2. Introduce core programming concepts of Python programming language.
CEO3. Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries.
CEO4. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these

Course Outcomes: On successful completion of this course, the students will be able to
CO1. Classify data structures of Python
CO2. Apply Python programming concepts to solve a variety of computational problems
CO3. Understand the principles of object-oriented programming (OOP) in Python, including classes, objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs
CO4. Become proficient in using commonly used Python libraries and frameworks such as JSON, XML, NumPy, pandas
CO5. Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries

List of Exercises/List of Experiments: Minimum Ten experiments are to be conducted.

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 viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number
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
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.
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.
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 basic slicing, integer and Boolean indexing.
27. Python program to find min, max, sum, cumulative sum of array
28. 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
29. 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

Text Books:
1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

SOFTWARE/Tools used: Anaconda. Jupyter Notebook**.**

ADDITIONAL LEARNING RESOURCES:
Online Learning Resources/Virtual Labs:
https://www.coursera.org/learn/python-for-applied-data-science-ai
https://www.coursera.org/learn/python?specialization=python#syllabus

UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT (Common to AIML, CE, CSE, ECE, EEE, ME)								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23HS411	**Humanities, Social Science and Management Course (HSMC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		2	1	0	3	30	70	100
Mid Exam Duration: 2 Hrs						**Sem.-End Exam Duration: 3 Hrs**		

Course Objectives:

CEO1. 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.

CEO2. 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.

CEO3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour and mutually enriching interaction with Nature.

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

CO1. Define the terms like Natural Acceptance, Happiness and Prosperity.

CO2. Identify one's self, and one's surroundings (family, society nature).

CO3. Apply what they have learnt to their own self in different day-to-day settings in real Life.

CO4. Relate human values with human relationship and human society.

CO5. Justify the need for universal human values and harmonious existence.

CO6. Develop as socially and ecologically responsible engineers.

UNIT-I: INTRODUCTION TO VALUE EDUCATION

General Introduction to Values - Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) - Understanding Value Education - Practice Session PS1 Sharing about Oneself - self-exploration as the Process for Value Education – Continuous Happiness and Prosperity – the Basic Human Aspirations - Practice Session PS2 Exploring Human Consciousness - Happiness and Prosperity – Current Scenario - Method to Fulfill the Basic Human Aspirations - Practice Session PS3 Exploring Natural Acceptance.

UNIT-II: HARMONY IN THE HUMAN BEING

Human Nature Relationships - Understanding Human being as the Co-existence of the self and the body - Distinguishing between the Needs of the self and the body - Practice Session PS4 Exploring the difference of Needs of self and body - The body as an Instrument of the self - Understanding Harmony in the self - Practice Session PS5 Exploring Sources of Imagination in the self - Harmony of the self with the body - Programme to ensure self-regulation and Health - Practice Session PS6 Exploring Harmony of self with the body.

UNIT-III: HARMONY IN THE FAMILY AND SOCIETY

Harmony in the Family – the Basic Unit of Human Interaction - 'Trust' – the Foundational Value in Relationship - Practice Session PS7 Exploring the Feeling of Trust - 'Respect' – as the Right

Evaluation - Practice Session PS8 Exploring the Feeling of Respect - Other Feelings, Justice in Human-to-Human Relationship - Understanding Harmony in the Society - Vision for the Universal Human Order.

UNIT-IV: HARMONY IN THE NATURE/EXISTENCE

Understanding Harmony in the Nature - Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature - Practice Session PS10 Exploring the Four Orders of Nature - Realizing Existence as Co-existence at All Levels - The Holistic Perception of Harmony in Existence - Practice Session PS11 Exploring Co-existence in Existence.

UNIT-V: HOLISTIC PERCEPTION OF HARMONY

Understanding the Harmony in the society - Universal Order - Practice Session PS12 Understanding the Harmony in the society - Critical appreciation of Human values - Justice, Trust.

TEXT BOOKS:

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 b. The Teacher's Manual.

2. 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)

IV Semester

ANALOG ELECTRONIC CIRCUITS								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2304405	**Professional Core (PC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		3	0	0	3	30	70	100

Pre-Requisites:

Electronic Devices and Circuits

Course Objectives:

CEO1. To give the basics knowledge of analog electronic circuits that is required for Linear Integrated Circuits, Embedded Systems and Digital Signal Processing.

CEO2. The ability to know the design of various analog circuits.

CEO3. The ability to understand the various amplifier, transistor and comparators characteristics.

CEO4. To study the timers, phase locked loops and operational amplifier.

CEO5. To study the configurations of amplifier, transistor and waveform generators.

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

CO1. Understand the concepts of diode clipping and clamping circuits, different amplifier configurations, operation of oscillator circuits, operational amplifiers, timers, ADC and DAC

CO2. Apply the above concepts for different circuit design

CO3. Analyze various circuit characteristics by using Amplifiers, Transistors, Comparators, Wave form generators, ADC and DAC

CO4. Analyze various circuit characteristics by using timers, Phase locked loops and operational amplifier

CO5. Evaluate different system configurations by using various amplifier, transistor and waveform Generators

UNIT-I: DIODE CLIPPING AND CLAMPING CIRCUITS, DC BIASING OF BJTs

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.

UNIT-II:

SMALL SIGNALS MODELING OF BJT & FEEDBACK AMPLIFIERS

Small Signals Modeling of BJT: Analysis of a Transistor Amplifier Circuit using h parameters, Simplified CE Hybrid Model, Frequency Response of CE and CC amplifiers.

Feedback Amplifiers: Classification of Amplifiers, the Feedback Concept, General Characteristics of Negative-Feedback Amplifiers, Effect of Negative Feedback upon Output and Input Resistances, Voltage-Series Feedback, Current-Series Feedback, Current-Shunt Feedback, Voltage-Shunt Feedback.

UNIT-III:

OSILLATOR CIRCUITS AND OPERATIONAL AMPLIFIERS

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

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

UNIT-IV:

OP-AMPS APLLICATIONS, COMPARATORS & WAVEFORM GENERATORS

OP-AMPS Applications: Introduction, Basic Op-Amp Applications, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converter, Sample and Hold Circuit, Log and Antilog Amplifier, Multiplier and Divider, 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, DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS

Timers and Phase Locked Loop: 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 – parallel Comparator type ADC, counter type ADC.

TEXT BOOKS:

1. Electronic Devices and Circuits- J. Millman, C.Halkias, Tata Mc-Graw Hill, 2nd Edition, 2010.

2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition, 2003.

REFERENCE BOOKS:

1. Electronic Devices and Circuit Theory – Robert L.Boylestad and Lowis Nashelsky, Pearson Edition, 2021.

2. Electronic Devices and Circuits–G.K. Mithal, Khanna Publisher, 23rd Edition, 2017.

3. Electronic Devices and Circuits – David Bell, Oxford, 5thEdition, 2008.

4. Electronic Principles–Malvino, Albert Paul, and David J. Bates, McGraw-Hill/Higher Education, 2007.

5. Operational Amplifiers and Linear Integrated Circuits– Gayakwad R.A, Prentice Hall India, 2002.

6. Operational Amplifiers and Linear Integrated Circuits –Sanjay Sharma, Kataria &Sons, 2nd Edition, 2010.

7. Design of Analog CMOS Integrated Circuits - Behzad Razavi

ADDITIONAL LEARNING RESOURCES:

https://nptel.ac.in/courses/122106025.

https://nptel.ac.in/courses/108102112

INDUCTION & SYNCHRONOUS MACHINES								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2302401	**Professional Core (PC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Mid Exam Duration: 2 Hrs						**Sem.-End Exam Duration: 3 Hrs**		

Pre-Requisites:

DC Machines & Transformers, Electrical Circuit Analysis-I

Course Objectives:

CEO1. To understand the construction and operation of Induction and Synchronous Machines.
CEO2. Analyze the performance of Induction Machines.
CEO3. Analyze the performance of Synchronous Machines.

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

CO1. Understand the construction, principle and operation of three phase induction motors.
CO2. Understand the starting and speed control methods and analyze the performance of three phase induction motors.
CO3. Analyze the principle and operation of single-phase motors.
CO4. Understand the construction and operation of Synchronous Generators and analyze parallel operation and also predetermines the regulation.
CO5. Analyze the operation and starting methods of synchronous motors, synchronous condensers.

UNIT-I: 3-PHASE INDUCTION MOTORS

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 – Torque equation – expressions for maximum torque and starting torque – torque-slip characteristics rotor power input, rotor copper loss and mechanical power developed and their inter-relationship.

UNIT-II: PERFORMANCE OF 3-PHASE INDUCTION MOTORS

Equivalent circuit – phasor diagram, Applications – 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 (Autotransformer starter and Star-Delta starter) -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

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, Operation of AC series motor, Reluctance Motor, Hysteresis Motor - Applications.

UNIT-IV: SYNCHRONOUS GENERATOR

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- Slip test - methods of synchronization– Parallel operation of alternators.

UNIT-V: SYNCHRONOUS MOTOR

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.

TEXT BOOKS:

- Electrical Machinery, Dr. P.S. Bhimbra, Khanna Publishing, 2021,First Edition.
- 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.

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/108/105/108105131/
2. https://nptel.ac.in/courses/108/106/108106072/
3. https://nptel.ac.in/courses/108/102/108102146/

CONTROL SYSTEMS (Common to EEE & ECE)								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2302402	**Engineering Science (ESC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		2	**1**	**0**	**3**	**30**	**70**	**100**
Mid Exam Duration: 2 Hrs						**Sem.-End Exam Duration: 3 Hrs**		

Pre-Requisites:
Calculus, differential equations, linear algebra, and basic physics along with fundamental engineering concepts and basic circuit theory.

Course Objectives:
CEO 1. Understand different control systems concepts.
CEO 2. Analyze time response concepts.
CEO 3. Assess stability using Routh-Hurwitz criterion, understand its limitations, and apply root locus methods.
CEO 4. Analyze frequency domain specifications
CEO 5. Understand state space analysis, concepts of controllability, observability and analyze using pole placement.

Course Outcomes: On successful completion of this course, the students will be able to
CO1. Model, analyze, and simplify control systems using transfer functions, feedback, block diagrams, and signal flow graphs to solve related numerical problems.
CO2. Analyze the time response of first and second-order systems, determine time response specifications, and calculate steady state errors and error constants to solve related numerical problems.
CO3. Assess system stability using Routh-Hurwitz criteria and root locus techniques, and understand the impact of poles and zeros on system stability.
CO4. Analyze frequency domain specifications and construct Bode and Polar plots to determine gain and phase margins.
CO5. Develop and analyze state models, derive transfer functions, solve state equations, and evaluate system controllability and observability and derive pole placement by state feedback

UNIT – I:
Control System Concepts
Introduction to control systems, classification, transfer function, effect of feedback, mathematical modeling of physical systems, block diagram, reduction techniques, signal flow graphs and mason's gain formula, numerical problems.

UNIT - II
Time Domain Analysis
Standard test signals, time response of first and second order systems- time response specifications, steady state error and error constants, numerical problems.

UNIT - III
Concept of Stability and Root Locus
The concept of stability, necessary conditions for stability – Routh Hurwitz's criterion – limitations of Routh's stability – Root locus concept – construction of Root loci, effect of poles & zeros on stability.

UNIT - IV
Frequency Domain Analysis

Introduction, frequency domain specifications, bode plots, Polar plots - gain and phase margin.

UNIT - V

State Space Analysis of Continuous Systems

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 its Properties, Controllability and observability, Pole Placement by state feedback - (Derivation only)..

TEXT BOOKS:

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

REFERENCE BOOKS:

1. "Modern Control Engineering" by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. "Control Systems Engineering" by NISE, 5th edition, John Wiley.

Analog Electronics Circuits Lab								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2304454	**Professional Core (PC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		0	**0**	**2**	**1**	**30**	**70**	**100**

Pre-Requisites:

Electrical and Electronics Engineering workshop, Electronic Devices and Circuits

Course Objectives:

CEO1. Understand the concepts of diode clipping and clamping circuits, different Amplifier configurations, operation of oscillator circuits, operational amplifiers, timers.

CEO2. Analyze various circuit characteristics by using Amplifiers, Transistors, Comparators, Wave form generators, ADC and DAC

CEO3. Analyze various circuit characteristics by using timers, Phase locked loops and operational amplifiers

CEO4. Evaluate different system configurations by using various amplifier, transistor and waveform generators

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

CO1. Understand the concepts of diode clipping and clamping circuits, different amplifier configurations, operation of oscillator circuits, operational amplifiers, timers.

CO2. Analyze various circuit characteristics by using Amplifiers, Transistors, Comparators, Wave form generators, ADC and DAC

CO3. Analyze various circuit characteristics by using timers, Phase locked loops and operational amplifier

CO4. Evaluate different system configurations by using various amplifier, transistor and waveform generators.

List of Exercises/List of Experiments: Minimum Ten experiments are to be conducted.

1 Analysis of Positive and Negative Clipper and Clamper Circuits.
2 Design of halfwave, full wave and bridge rectifier circuits.
3 Design of Phase Shift and Wien Bridge Oscillators using IC 741 Op-Amp.
4 Design of Operational Amplifiers - Inverting and non-inverting amplifiers.
5 Design of Astable multivibrator, Monostable multivibrator
6 Design of Adder, Subtractor, Comparator Circuits using IC741 OP-AMP.
7 Schmitt Trigger Circuits – using IC 741 and IC 555.
8 Integrator and Differentiator Circuits using IC 741 OP AMP.
9 Design of IC 555 Timers – Monostable Operation Circuits.
10 Study and application of PLL in frequency synthesis-capture range, lock range and free running VCO Frequency.

TEXT BOOKS:

1. Electronic Devices and Circuits- J. Millman, C.Halkias, Tata Mc-Graw Hill, 2nd Edition, 2010.
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition, 2003.

REFERENCE BOOKS:

1. Electronic Devices and Circuit Theory – Robert L.Boylestad and Lowis Nashelsky, Pearson Edition, 2021.
2. Electronic Devices and Circuits–G.K. Mithal, Khanna Publisher, 23rd Edition, 2017.
3. Electronic Devices and Circuits – David Bell, Oxford, 5thEdition, 2008.
4. Electronic Principles–Malvino, Albert Paul, and David J. Bates, McGraw-Hill/Higher Education, 2007.
5. Operational Amplifiers and Linear Integrated Circuits– Gayakwad R.A, Prentice Hall, India, 2002.
6. Operational Amplifiers and Linear Integrated Circuits –Sanjay Sharma, Kataria & Sons, 2nd Edition, 2010.
7. Design of Analog CMOS Integrated Circuits - Behzad Razavi

SOFTWARE/TOOLS USED

- MATLAB/Simulation
- NI MULTISIM

ADDITIONAL LEARNING RESOURCES:

1. https://nptel.ac.in/courses/122106025
2. https://nptel.ac.in/courses/108102112

INDUCTION & SYNCHRONOUS MACHINES LAB								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2302451	**Professional Core (PC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		0	**0**	**3**	**1.5**	**30**	**70**	**100**

Pre-Requisites:

INDUCTION & SYNCHRONOUS MACHINES

Course Objectives:

CEO1. To get the ability to analyze the performance of induction motors.
CEO2. To get the ability to estimate the reactance and regulation of alternators.
CEO3. To obtain the equivalent circuit of 1-phase induction motor.
CEO4. To evaluate the performance of 3-phase induction motors.

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

CO1. Analyze various performance characteristics pf 3-phase and 1-phase Induction Motors
CO2. Evaluate the performance of 3-phase induction motor by obtaining the circle diagram and equivalent circuit of 1-phase induction motor.
CO3. Predetermine the regulation of 3-phase alternator

List of Exercises/List of Experiments: Minimum Ten experiments are 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 pole changing 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 Xd, Xq & 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. Speed control of three phase slip-ring induction motor.

REFERENCE BOOKS/LABORATORY MANUALS:

https://em-coep.vlabs.ac.in/List%20of%20experiments.html

DATA STRUCTURES								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23A05305	**Skill Enhancement Course**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		0	**1**	**2**	**2**	**30**	**70**	**100**

Pre-Requisites:

Programming in C Language.

Course Objectives:

CEO1. Acquire practical skills to design and analyze simple linear and non-linear data structures

CEO3. To identify and apply the suitable data structure for the given real world problem.

CEO2. To gain knowledge in practical applications of data structures.

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

CO1. Understand the role of data structures in organizing and accessing data (L2)

CO2. Design, implement and apply linked lists for dynamic data storage (L3)

CO3. Develop applications using stacks and queues (L5)

CO4. Design and implement algorithms for operations on binary trees and binary search trees (L5)

CO5. Design novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees (L5)

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.
   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: 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.

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
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick

DESIGN THINKING AND INNOVATION								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2304453	**Engineering Science (ESC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		1	**0**	**2**	**2**	**30**	**70**	**100**

Pre-Requisites:

Management science

Course Objectives:

CEO1. To familiarize students with design thinking process as a tool for breakthrough innovation.

CEO2. To equip students with design thinking skills and ignite

CEO3. To create innovative ideas, develop solutions for real-time problems.

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

CO1: Define the concepts related to design thinking (L1, L2)

CO2: Explain the fundamentals of Design Thinking and innovation (L1, L2)

CO3: Apply the design thinking techniques for solving problems in various sectors. (L3)

CO4: Analyse to work in a multidisciplinary environment(L4)

CO5: Evaluate the value of creativity(L5)

Unit I :

Introduction to Design Thinking: 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: 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: Artofinnovation, 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: Problem formation, introduction to product design, Product strategies, Product value, Product planning, product Specifications-Innovation towards product design-Case studies

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

Unit V :

Design thinking in Business Processes: 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.

TEXTBOOKS:

1. Tim Brown, "Change by design", Harper Bollins (2009)
2. Idris Mootee, "Design Thinking in Business Processes", 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

Online Learning Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview

ENVIRONMENTAL SCIENCE (Common to AIML, CE, CSE, ECE, EEE, ME)								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
23HS431	**Basic Sciences (BS)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**Sem.-End Exam**	**Total**
		2	**0**	**0**	**0**	**30**	**00**	**30**
Mid Exam Duration: 2 Hrs						**Sem.-End Exam Duration: 0 Hrs**		
Pre-Requisites:								
Course Objectives: **CEO1.** To make the students to get awareness on environment. **CEO2.** To stress the importance of protecting natural resources, ecosystems for future generations and pollution cause due to the day-to -ay activities of human life. **CEO3.** To save earth from the inventions by the engineers.								
Course Outcomes: On successful completion of this course, the students will be able to **CO1. Influence** the society in proper utilization of Natural resources. **CO2. Quantify** the interconnection of human dependence on this ecosystem. **CO3. Recall** the concepts of biodiversity & gain knowledge on distribution at different levels. **CO4. Analyze** the impact of environmental pollution on environment & solving environmental problems **CO5. Discuss** environmental laws & analyze the environmental concerns and follow sustainable developmental activities.								

UNIT-I:

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, waterlogging, salinity, case studies. – Energy resources:

UNIT-II:

Ecosystems: Concept of an ecosystem. – 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).

UNIT-III:

Biodiversity and its Conservation : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical 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-IV:

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-V:

Social Issues and the Environment: From Unsustainable to Sustainable development. Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents. Environment Protection Act. – Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act.

Human Population and the Environment: 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.

Field Work: Visit to a local area to document environmental assets River/forest grassland/ hill/ mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

TEXT BOOKS:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental studies by Benny Joseph, Mc, Graw Hill Publications.
3. Principles and a basic course of Environmental science for under graduate course by Kousic,
4. Text book of Environmental science and Technology by M. Anji Reddy, BS Publication.

REFERENCE BOOKS:

1. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Printice hall of India Private limited.
2. Environmental Studies by Anindita Basak – Pearson education.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.
4. Environmental Science, A Global Concerns, William P. Cunningham, Mary Ann Cunningham, Mc Graw Hill publications.