SASI INSTITUTE OF TECHNOLOGY AND ENGINEERING

SITE23 REGULATIONS AND COMPLETE SYLLABUS FOR I, II, III AND IV SEMESTERS

Department of Electrical & Electronics Engineering

SASI INSTITUTE OF TECHNOLOGY AND ENGINEERING

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B.Tech. (Regular-Full time)

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

&

B.Tech.(Lateral Entry Scheme)

(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year **2024-25** onwards)

COURSE STRUCTURE AND SYLLABUS FOR

I, II, III & IV SEMESTER

SITE-23 REGULATIONS

Academic Regulations (SITE23) 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

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

a) 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).

b) Registers for 160 credits and secures all 160 credits.

ii) **Award of B.Tech. Degree with Honors** if he/she fulfils thefollowing:

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

b) Registering for Honors isoptional.

c) Honors is to be completed simultaneously with B.Tech. Programme.

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 obtained by the student in the common entrance examination conducted by the A.P. Government/University or any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

4. Program related term

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

Credit Definition:

1 Hr. Lecture (L) per week	01 credit
1 Hr. Tutorial (T) per week	01 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hrs. Practical (Lab) per week	01 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 ofstudy.

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

6. Structure of the Undergraduate Programme

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

S.No.	Category	Breakup of Credits (Total160)	Percentage of total credits	AICTE Recommendation (%)
1.	Humanities and Social Science including Management (HM)	13	8 %	8 – 9%
2.	Basic Sciences (BS)	20	13 %	12 - 16%
3.	Engineering Sciences (ES)	23.5	14%	10 – 18%
4.	Professional Core (PC)	54.5	34 %	30 – 36%
5.	Electives – Professional (PE) & Open (OE); Domain Specific Skill Enhancement Courses (SEC)	33	21 %	19 - 23%
6.	Internships & Project work (PR)	16	10 %	8 – 11%
7.	Mandatory Courses (MC)	Non-credit	Non-credit	-

7. Course Classification:

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

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

8. Programme Pattern

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

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

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

iv) There shall be mandatory student induction program for fresher's, with a three- week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas,

Familiarization to Dept./Branch & Innovations etc., are included as per the guidelines issued by AICTE.

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

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

vii) Design thinking for Innovation & Tinkering Labs is 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 Open Elective courses.

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

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 programme. The internship at the end of second year shall be community oriented and industry internship at the end of third year.

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

xv) Undergraduate degree with Honors is introduced by the University for the students having good academicrecord.

xvi) Each 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 regularlabs.

xvii) Each college shall assign a faculty advisor/mentor after admission to a groupof students from same department to provide guidance in courses registration/careergrowth/placements/opportunities for higher studies/GATE/other competitive examsetc.

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 examination question paper shall beset with two parts each for 35 marks.
iv. If any subject is having both theory and practical components, they will be evaluated separately as theory subject and practical subject. However, they will be given same subject code with an extension of ‘T’ for theory subject and ‘P’ for practical subject.

a) Continuous Internal Evaluation

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

ii) Objective paper shall contain for 05 short answer questions with 2 marks each or maximum of 20 bits for 10 marks. Subjective paper shall contain 3 either or type questions (totally six questions from1 to 6) of which student has to answer one from each either-or type of questions. Each question carries 10 marks. The marks obtained in the subjective paper are condensed to 15 marks.

Note:

- The objective paper shall be prepared in line with the quality of competitive examinations questions.
- The subjective paper shall contain 3 either or type questions of equal weightage of 10 marks. Any fraction shall be rounded off to the next higher mark.
- The objective paper shall be conducted by the respective institution on the day of subjective paper test.
- Assignments shall be in the form of problems, mini projects, design problems, sliptests, quizzes etc., depending on the course content. It should be continuous assessment throughout the semester and the average marks shall be considered.

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

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

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

For Example:

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

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

For Example:

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

b) End Examination Evaluation:

End examination of theory subjects shall have the following pattern:

i) There shall be 11 questions in which first question is compulsory and from questions 2 to 11 there shall be two questions from each unit with internal choice.
ii) Question 1 shall contain 10 compulsory short answer questions, two from each unit for a total of 20 marks such that each question carries 2 marks.
iii) From questions 2 to 11, each question carries 10 marks. Student shall answer one question from each unit.

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

i) The question paper shall be in two parts viz., Part A and Part B with equal weightage of 35marks each.
ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1mark.
iii) In each part, questions from 2 to 7, there shall be two questions from each unit with internal choice for10 marks each. Students shall answer any one of them.

Practical Courses

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

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

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

In a practical subject consisting of two parts (Eg.: Basic Electrical & Electronics Engineering Lab), the end examination shall be conducted for 70 marks as a single laboratory in 3hours. 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 based on the reports/submissions prepared in the class. And there shall be two mid term examinations in a semester for duration of 2 hours each for 15marks with weightage of 80% to better mid marks and 20% for the other. The subjective paper shall contain 3 either or type questions of equal weightage of 5 marks. There shall be no objective paper in mid semester examination. The sum of day-to-day evaluation and the mid semester marks will be the final sessional marks for the subject.

The end examination pattern for Engineering Graphics, shall consists of 5 questions, either/or type, of 14 marks each. There shall be no objective type questions in the end

examination. However, the end examination pattern for other subjects related to design/drawing , multiple branches, etc is mentioned along with the syllabus.

e) There shall be no external examination for mandatory courses with zero credits. However, attendance shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 40% or more in the internal examinations. In case, the student fails, a re- examination shall be conducted for failed candidates for 30 marks satisfying the conditions mentioned in item 1 & 2 of the regulations.
f) The laboratory records and mid semester test papers shall be preserved for a minimum of 3 years in the respective institutions as per the University norms and shall be produced to the Committees of the University as and when the same are asked for.

10. Skill oriented Courses

i) There shall be five skill-oriented courses offered during III to VII semesters.
ii) Out of the five skill courses two shall be skill-oriented courses from the same domain. Of the remaining three skill courses, one shall be as of skill course and the remaining two shall be skill-advanced courses from the same domain/Interdisciplinary/Joboriented.
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 for30 marks by the concerned teacher based on the regularity/assignments/viva/mid semester test. The end examination similar to practical examination pattern shall be conducted by the concerned teacher and an expert in the subject nominated by the principal.
iv) The Head of the Department shall identify a faculty member as coordinator for the course. A committee consisting of the Head of the Department, coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process. The marks/grades shall be assigned to the students by the above committee based on their performance.
v) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies or any other accredited bodies. If a student chooses to take a Certificate Course offered by external agencies, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency. A committee shall be formed at

the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalentmarks/grades.

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

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

11. Massive Open Online Courses (MOOCs):

A Student has to pursue and complete one course compulsorily through MOOCs approved by the 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 12weeks) offered through MOOCs with the approval of Head of the Department. The Head of the Department shall appoint one mentor to monitor the student's progression. The student needs to earn a certificate by passing the exam. The student shall be awarded the credits assigned in the curriculum only by submission of the certificate. Examination fee, if any, will be borne by the student.

Students who have qualified in the proctored examinations conducted through MOOCs platform can apply for credit transfer as specified and are exempted from appearing internal as well as external examination (for the specified equivalent credit course only) conducted by the university.

Necessary amendments in rules and regulations regarding adoption of MOOC courses would be proposed from time to time.

12. Credit Transfer Policy

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

i) The University shall offer credit mobility for MOOCs and give the equivalent credit weightage to the students for the credits earned through online learning courses.
ii) Student registration for the MOOCs shall be only through the respective department of the institution, it is mandatory for the student to share necessary information with the department.
iii) Credit transfer policy will be applicable to the Professional & Open Elective courses only.
iv) The concerned department shall identify the courses permitted for credit transfer.
v) The University/institution shall notify at the beginning of semester the list of the online learning courses eligible for credit transfer.
vi) The institution shall designate a faculty member as a Mentor for each course to guide the students from registration till completion of the credit course.
vii) The university shall ensure no overlap of MOOC exams with that of the university examination schedule. In case of delay in results, the university will re-issue the marks sheet for such students.
viii) Student pursuing courses under MOOCs shall acquire the required credits only after successful completion of the course and submitting a certificate issued by the competent authority along with the percentage of marks and grades.
ix) The institution shall submit the following to the examination section of the university:
    a) List of students who have passed MOOC courses in the current semester along with the certificate of completion.
    b) Undertaking form filled by the students for credit transfer.
x) The universities 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 University from time to time.

13. Academic Bank of Credits (ABC)

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

i) Provide option of mobility for learners across the universities of their choice
ii) Provide option to gain the credits through MOOCs from approved digital platforms.
iii) Facilitate award of certificate/diploma/degree in line with the accumulated credits in ABC
iv) Execute Multiple Entry and Exit system with credit count, credit transfer and credit acceptance from students' account.

14. Mandatory Internships

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

Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee comprising of Head of the Department, supervisor of the internship and a senior faculty member of the department. A certificate of successful completion from industry shall be included in the report. The report and the oral presentation shall carry 50% 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 University.

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 30marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the University and is evaluated for 140marks.

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 complete the compulsory courses (or equivalents) before registering for the electives.
iii) Electives (minimum of 2 courses) to complete a total of 12 credits.

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

16. Guidelines for offering Honors

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

i) Honors is introduced in the curriculum of all B. Tech. programs offering a major degree and is applicable to all B. Tech (Regular and Lateral Entry) students admitted in Engineering & Technology.
ii) A student shall earn additional 15 credits for award of B.Tech.(Honors) degree from same branch/department/discipline registered for major degree. This is in addition to the credits essential for obtaining the Undergraduate degree in Major Discipline (i.e., 160credits).
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) Students can complete the courses offered under Honors either in the college or in online platforms like SWAYAM with a minimum duration of 12 weeks for a 3-credit course and 8 weeks duration for a 2-credit course satisfying the criteria for credit mobility. If the courses under Honors are offered in conventional mode, then the teaching and evaluation procedure shall be similar to regular B. Tech. courses.
vii) The attendance for the registered courses under Honors and regular courses offered for Major degree in a semester are to be considered separately.
viii) A student shall maintain an attendance of 75% in all registered courses under Honors to be eligible for attending semester end examinations.
ix) A student registered for Honors shall pass in all subjects that constitute the requirement for the Honors degree program**.** No class/division (i.e., second class, first class and distinction, etc.) shall be awarded for Honors degree programme.

x) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into open or core electives; they will remain extra. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
xi) The Honors will be mentioned in the degree certificate as Bachelor of Technology (Honors) in XYZ. For example, B.Tech. (Honors) in Mechanical Engineering

Enrolment into Honors:

i) Students of a Department/Discipline are eligible to opt for Honors program offered by the same Department/Discipline
ii) The enrolment of student into Honors is based on the CGPA obtained in the major degree program. CGPA shall be taken upto 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 honours.
iii) If a student is detained due to lack of attendance either in Major or in Honors, registration shall be cancelled.
iv) Transfer of credits from Honors to regular B. Tech degree and vice-versa shall not be permitted.
v) Honors is to be completed simultaneously with a Major degree program.

Registration for Honors:

i) The eligible and interested students shall apply through the HOD of his/her parent department. The whole process should be completed within one week before the start of every semester. Selected students shall be permitted to register the courses under Honors.
ii) The selected students shall submit their willingness to the principal through his/her parent department offering Honors. The parent department shall maintain the record of student pursuing the Honors.
iii) The students enrolled in the Honors courses will be monitored continuously. An advisor/mentor from parent department shall be assigned to a group of students to monitor the progress.
iv) There is no fee for registration of subjects for Honors program offered in offline at the respective institutions.

17. Attendance Requirements:

i) A student shall be eligible to appear for the University external examinations if he/she acquires a minimum of 40% attendance in each subject and 75% of attendance in aggregate of all the subjects. 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 University.

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 read mission for that semester from the date of commencement of class work.

vi) Ifanycandidatefulfilstheattendancerequirementinthepresentsemester, he shall not be eligible for readmission into the same class.

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

viii) For induction programme attendance shall be maintained as per AICTE norms.

18. Promotion Rules:

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

i) A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per university norms.

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

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

been studied up to V semester.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 be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

19. Grading:

As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades and corresponding percentage of marks shall be followed:

After each course is evaluated for100 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 in the 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 points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

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

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

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

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

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

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

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

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by the letters S, A, B, C, D and F.

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	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 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 university or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld in such cases.

21. Multiple Entry / Exit Option

(a) Exit Policy:

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

i) **UG Certificate in (Field of study/discipline)** - Programme duration: First year (first two semesters) of the undergraduate programme, 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 work force.

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

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

(b) Entry Policy:

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

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

22. Gap Year Concept:

Gap year concept for Student Entrepreneur in Residence is introduced and outstanding students who wish to pursue entrepreneurship/become entrepreneur are allowed to take a break of one year at any time after II year to pursue full-time entrepreneurship programme/to establish 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 principal of the respective college shall forward such proposals submitted by the students to the University. An evaluation committee constituted by the University shall evaluate the proposal submitted by the student and the committee shall decide whether to permit the student(s) to avail the Gap Year or not

23. Transitory Regulations

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

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

24. Minimum Instruction Days for a Semester:

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

25. Medium of Instruction:

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

26. Student Transfers:

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

27. General Instructions:

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 Vice-Chancellor is final.
v) The Universities may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Universities.
vi) In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Vice-Chancellor / Head of the institution is final.

*** *** ***

ACADEMIC REGULATIONS (SITE23)
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

i) 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 120credits.

ii) **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., 120credits.
   (ii) Registering for Honors is optional.
   (iii) Honors is to be completed simultaneously with B.Tech. programme.

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

3. Minimum Academic Requirements

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

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

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

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

4. Course Pattern

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

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

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

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

Department Codes

Department	Two-character code
Artificial Intelligence and Machine Learning	AM
Civil Engineering	CE
Electrical & Electronics Engineering	EE
Mechanical Engineering	ME
Electronics & Communications Technology	ET
Computer Science and Engineering (Artificial Intelligence and Machine Learning)	CA
Computer Science and Engineering (IoT and Cyber Security including Block Chain Technology)	CI
Computer Science and Engineering (Data Science)	CD
Computer Science and Engineering	CS
Computer Science and Technology	CST
Information Technology	IT
Management Science	MS
Mathematics	MA
Physics	PH
Chemistry	CH
English	EG
Biology	BI
Common to All Branches	CM

Malpractice

DISCIPLINARY ACTION FOR MALPRACTICES/IMPROPER CONDUCT IN EXAMS

S.No.	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
1. (b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year.The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for

		examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be

	damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to

		the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

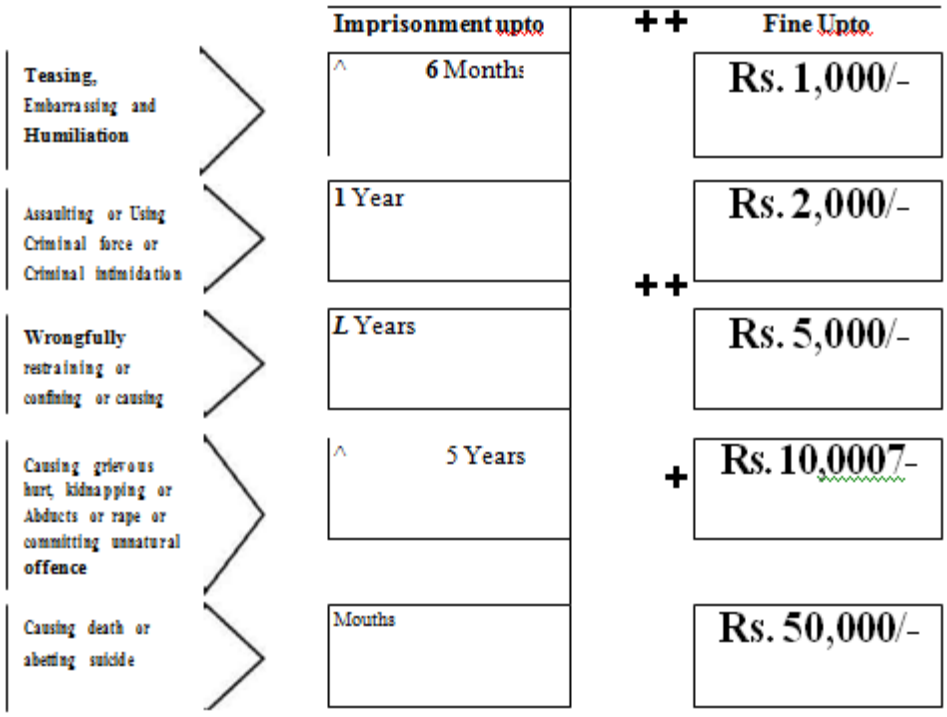
MALPRACTICES

- The Principal shall refer the cases of malpractices in Continuous Evaluation and Semester-End Examinations, to Malpractice Enquiry Committee, constituted by him/her for the purpose. Such committee shall follow the approved scales of punishment. The Principal shall take necessary action, against the erring students based on the recommendations of the committee.
- Any action on the part of student at an examination trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the Staff, who are in charge of conducting examinations, valuing examination papers and preparing/keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.

Ragging

Prohibition of ragging in educational institutions Act 26 of 1997 Salient Features

- Ragging within or outside any educational institution is prohibited.
- Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student.



LET US MAKE SITE RAGGING FREE INSTITUTE

Program Outcomes for an Engineering Graduates:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. 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.
7. **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.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

B. Tech-COURSE STRUCTURE – SITE23
(Applicable from the academic year 2023-24 onwards)

INDUCTION PROGRAMME

S.No.	Course Name	Category	L-T-P-C
1	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2	Career Counselling	MC	2-0-2-0
3	Orientation to all branches -- career options, tools, etc.	MC	3-0-0-0
4	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2-0-3-0
5	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7	Remedial Training in Foundation Courses	MC	2-1-2-0
8	Human Values & Professional Ethics	MC	3-0-0-0
9	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10	Concepts of Programming	ES	2-0-2-0

Group-A
I Sem. B.Tech (AIML, CIC, CSE, CSD, CSM & CST)

S.No.	Subject Code	Course	L	T	P	C
1	23CMEGT1010	Communicative English	2	0	0	2
2	23CMMAT1020	Linear Algebra & Calculus	3	0	0	3
3	23AMCHT1030 23CICHT1030 23CSCHT1030 23CDCHT1030 23CACHT1030 23CTCHT1030	Chemistry	3	0	0	3
4	23CMCET1040	Basic Civil & Mechanical Engineering	3	0	0	3
5	23CMCST1050	Introduction to C-Programming	3	0	0	3
6	23CMEGL1060	Communicative English Lab	0	0	2	1
7	23AMCHL1070 23CDCHL1070 23CACHL1070 23CICHL1070 23CSCHL1070 23CTCH1L070	Chemistry Lab	0	0	2	1
8	23CMCSL1080	Computer Programming Lab	0	0	3	1.5
9	23CMMEL1090	Engineering Workshop	0	0	3	1.5
10	23CMPES1100	Health and wellness, Yoga and Sports	-	-	1	0.5
Total			**14**	**0**	**11**	**19.5**

Group-B
I Sem. B.Tech (CE, ME, EEE, ECT, ECE & IT)

S.No.	Subject Code	Course	L	T	P	C
1	23CMMAT1010	Linear Algebra & Calculus	3	0	0	3
2	23CMPHT1020	Engineering Physics	3	0	0	3
3	23CMCST1030	Introduction to C-Programming	3	0	0	3
4	23CMEET1040	Basic Electrical & Electronics Engineering	3	0	0	3
5	23CMMET1050	Engineering Graphics	1	0	4	3
6	23CMCSL1060	IT Workshop	0	0	2	1
7	23CMPHL1070	Engineering Physics Lab	0	0	2	1
8	23CMCSL1080	Computer Programming Lab	0	0	3	1.5
9	23CMEEL1090	Electrical & Electronics Engineering Workshop	0	0	3	1.5
10	23CMNSS1100	NSS/NCC/Scouts &Guides/Community Service	-	-	1	0.5
Total			**13**	**0**	**15**	**20.5**

Group-A

II Sem. B.Tech (AIML, CIC, CSE, CSD, CSM & CST)

S.No.	Subject Code	Course	L	T	P	C
1	23CMMAT2010	Differential Equations & Vector Calculus	3	0	0	3
2	23CMPHT2020	Engineering Physics	3	0	0	3
3	23CMEET2030	Basic Electrical & Electronics Engineering	3	0	0	3
4	23CMMET2040	Engineering Graphics	1	0	4	3
5	23AMAMT2050 23CICIT2050 23CDCDT2050 23CSCST2050 23CACAT2050 23CTCTT2050	Data Structures	3	0	0	3
6	23CMPHL2060	Engineering Physics Lab	0	0	2	1
7	23CMCSL2070	IT Workshop	0	0	2	1
8	23CMEEL2080	Electrical and Electronics Engineering Workshop	0	0	3	1.5
9	23AMAML2090 23CICIL2090 23CDCDL2090 23CSCSL2090 23CACAL2090 23CTCTL2090	Data Structures Lab	0	0	3	1.5
10	23CMNSS2100	NSS/NCC/Scouts&Guides/Community Service	-	-	1	0.5
Total			**13**	**0**	**15**	**20.5**

Group-B

II Sem. B.Tech (CE, ME, EEE, ECT, ECE & IT)

S.No.	Subject Code	Course	L	T	P	C
1	23CMEGT2010	Communicative English	2	0	0	2
2	23CMMAT2020	Differential Equations & Vector Calculus	3	0	0	3
3	23CECHT2030 23MECHT2030	Engineering Chemistry	3	0	0	3
	23ECCHT2030 23ETCHT2030 23EECHT2030 23ITCHT2030	Chemistry	3	0	0	3
4	23CMCET2040	Basic Civil & Mechanical Engineering	3	0	0	3
5	23CECET2050 23MEMET2050 23ECECT2050 23ETETT2050 23EEEET2050 23ITITT2050	Engineering Mechanics Engineering Mechanics Network Analysis Network Analysis Electrical Circuit Analysis-I Data Structures	3	0	0	3
6	23CMEGL2060	Communicative English Lab	0	0	2	1
7	23CECHL2070 23MECHL2070	Engineering Chemistry Lab	0	0	2	1
	23ECCHL2070 23ETCHL2070 23EECHL2070 23ITCHL2070	Chemistry Lab	0	0	2	1
8	23CMMEL2080	Engineering Workshop	0	0	3	1.5
9	23CECEL2090 23MEMEL2090 23ECECL2090 23ETETL2090 23EEEEL2090 23ITITL2090	Engineering Mechanics & Building Practices Lab Engineering Mechanics Network Analysis & Simulation Lab Network Analysis & Simulation Lab Electrical Circuit Lab Data Structures Lab	0	0	3	1.5
10	23CMPES2100	Health and Wellness, Yoga Sports	-	-	1	0.5
Total			**13**	**0**	**15**	**20.5**

COMMUNCATIVE ENGLISH			
Subject Code	**23CMEGT1010/2010**	**IA Marks**	**30**
Number of Lecture Hours/ Week	**02**	**Exam Marks**	**70**
Total Number of Lecture Hours	**32**	**Exams Hours**	**03**
Credits -02			

Course Objectives:

1.	To facilitate effective listening, reading, speaking and writing skills among the learners and to comprehend in both social and transactional dialogues.
2.	To develop learners to skillfully apply grammatical structures to construct sentences, ensuring proper word forms in both spoken and written communication.
3.	To enable the skill to analyze and utilize discourse markers, enabling clear expression of thoughts in informal discussions on specific topics.
4.	To enhance learners comprehending abilities to write comprehensive summaries based on global comprehension of the texts.
5.	Enable students to create well-organized and coherent paragraphs, essays, and resumes

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.	07 Hrs
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	07 Hrs
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 **Vocabulary:** Compound words, Collocations	07 Hrs
Unit IV	
Lesson: INSPIRATION: The Toys of Peace by Saki **Listening:** Making predictions while listening to conversations/ transactional dialogues	07 Hrs

without video; listening with video. **Speaking:** Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. **Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Letter Writing: Official Letters, Resumes **Grammar:** Reporting verbs, Direct & Indirect speech, Active & Passive Voice **Vocabulary:** Words often confused, Jargons	
Unit V	
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) **Vocabulary:** Technical Jargons	06 Hrs

Course Outcome:

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.

Question Paper Pattern:

1. There shall be 11 questions in which first question is compulsory and from questions 2 to 11 there shall be two questions from each unit with internal choice.
2. Question 1 shall contain 10 compulsory short answer questions, two from each unit for a total of 20 marks such that each question carries 2 marks.
3. From questions 2 to 11, each question carries 10 marks. Student shall answer one question from each unit.

Textbooks:

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. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.

Web Resources:

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

Linear Algebra & Calculus			
Subject Code	**23CMMAT1010/20**	**IA Marks**	**30**
Number of Lecture Hours/ Week	**03**	**Exam Marks**	**70**
Total Number of Lecture Hours	**48**	**Exams Hours**	**03**
Credits: 03			

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.

Unit I	
Matrices: Rank of a matrix by echelon form, normal form, PAQ form. Cauchy - Binet formulae (without proof). Inverse of Non-singular matrices by Gauss –Jordan method, System of linear equations: Consistent and inconsistent, Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods. Applications: Finding the current in a electrical circuit	10 Hrs
Unit II	
Eigen values, Eigen vectors and Orthogonal Transformation: Eigen values, Eigen vectors and their properties, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Diagonalization of a matrix, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.	10 Hrs
Unit III	
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 theorems with remainders (without proof), Problems and applications on the above theorems.	10 Hrs
Unit IV	
Partial differentiation and Applications (Multi variable calculus): Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Euler's theorem, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobian, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.	08 Hrs
Unit V	
Multiple Integrals (Multi variable Calculus): Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).	10 Hrs

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

CO1	Develop and use of matrix algebra techniques that are needed by engineersf or Practical applications.
CO2	Utilize mean value theorems to real life problems.
CO3	Familiarize with functions of several variables which is 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.

Text Books:

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

Reference Books:

1. Thomas Calculus, George B.Thomas, Maurice D.Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R.K.Jain and S.R.K.Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Michael Greenberg, Pearson publishers, 9th edition.
5. Higher Engineering Mathematics, H.KDas, Er.RajnishVerma, S.Chand Publications, 2014, Third Edition (Reprint 2021).
6. B. V. Ramana, Higher Engineering Mathematics, 2013 Edition, Tata Mc. Graw Hill Education.

Web Resources:

1. http://tutorial.math.lamar.edu/Classes/CaleIII/Multipleintegralsintro.aspx
2. https://www.math.hkust.edu.hk/~machas/matrix-algebra-for-engineers.pdf
3. https://onlinecourses.nptel.ac.in/noc21_ma16/preview
4. https://www.youtube.com/watch?v=SV5uLUd_PT8&list=PLKS7ZMKnbPrQf7IBhKlsnLXwJRZSDMhun&index=3
5. https://www.youtube.com/watch?v=NCUG-G_RkAM

CHEMISTRY			
Subject Code	**23EECHT2030**	**IA Marks**	**30**
Number of Lecture Hours/ Week	**03**	**Exam Marks**	**70**
Total Number of Lecture Hours	**48**	**Exams Hours**	**03**
Credits:03			

Course Objectives

The objectives of this course, help the students to

1 Familiarize modern engineering materials and its applications
2 Train the students on the principles and applications of electrochemistry and polymers
3 Introduce instrumental methods and chromatography

Unit I	
Structure and Bonding Models Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of Ψ and Ψ^2, particle in one dimensional box, molecular orbital theory – bonding in homo- and hetero nuclear diatomic molecules – energy level diagrams of O2 and CO, etc. π-molecular orbitals of butadiene and benzene, calculation of bond order.	09 Hrs
Unit II	
Modern Engineering materials Semiconductors: Introduction, preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion and ion implantation), applications Superconductors: Introduction - Types, properties and applications. Supercapacitors: Introduction, basic concept - Classification - Applications. Nano materials: Introduction, classification of carbon nanotubes, properties and applications of fullerenes, carbon nanotubes and Graphene nanoparticles.	09 Hrs
Unit III	
Electrochemistry and Applications Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry - potentiometric titrations (redoxtitrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations). Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, Secondary cells – lithium–ion batteries – working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen fuel cell – working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).	10 Hrs
Unit IV	
Polymer Chemistry: Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanism of free radical addition polymer formation. Poly Dispersity Index. 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), Poly Lactic Acid	10 Hrs

(PLA).	
Unit V	
Instrumental Methods and Applications Electro-magnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy - Instrumentation, applications, IR spectroscopy - Instrumentation, applications. Chromatography - Basic Principle, Classification – Thin Layer and Paper Chromatography, HPLC: Instrumentation and Applications.	10 Hrs

Course Outcome:
On completion of the course student will be able to

CO1	Interpret the bond order and magnetic character of molecules.
CO2	Recall the properties and applications of nano materials.
CO3	Outline the applications of semiconductors and super conductors.
CO4	Compare the materials of construction for battery and electrochemical cells.
CO5	Explain the preparation, properties and applications of thermo and thermosetting plastics and rubbers
CO6	Summarize the concepts of Instrumental methods.

Textbooks:

1. P.C. Jain and M. Jain "Engineering Chemistry", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Shikha Agarwal, "Engineering Chemistry", Cambridge University Press, New Delhi, (2019).
3. S.S. Dara, "A Textbook of Engineering Chemistry", S.Chand& Co, (2010).
4. Shashi Chawla, "Engineering Chemistry", Dhanpat Rai Publicating Co. (Latest edition).
5. Fundamentals of Molecular Spectroscopy, by C. N. Banwell.

Reference Books:

1. K. Sesha Maheshwaramma and Mridula Chugh, "Engineering Chemistry", Pearson India Edn.
2. O.G. Palana, "Engineering Chemistry", Tata McGraw Hill Education Private Limited, (2009)
3. CNR Rao and JM Honig (Eds) "Preparation and characterization of materials" Academic press, New York (latest edition)

BASIC CIVIL AND MECHANICAL ENGINEERING			
Subject Code	**23CMCET1040/2040**	**IA Marks**	**30**
Number of Lecture Hours/ Week	**3**	**Exam Marks**	**70**
Total Number of Lecture Hours	**48**	**Exams Hours**	**03**
Credits: 03			

PART A: BASIC CIVIL ENGINEERING

Course Objectives

1 Get familiarized with the scope and importance of Civil Engineering sub-divisions and Introduction to basic civil engineering materials and construction techniques.
2 Introduce the preliminary concepts of surveying.
3 Acquire preliminary knowledge on transportation and its importance in nations economy and Get familiarized with the importance of quality, conveyance and storage of water

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. Introduction to Prefabricated construction Techniques.	08 Hrs
Unit II	
Surveying: Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Levelling instruments used for levelling - Simple problems on levelling and bearings-Contour mapping.	08 Hrs
Unit III	
Transportation Engineering Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering. **Water Resources and Environmental Engineering:** Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology Rainwater Harvesting- Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).	08 Hrs

Course Outcome:

CO1	Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society and Understand the basic characteristics of Civil Engineering Materials and attain knowledge on prefabricated technology.
CO2	Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.
CO3	Realize the importance of Transportation in nation's economy and the engineering measures related to Transportation and Understand the importance of Water Storage and Conveyance Structures so that the social responsibilities of water conservation will be appreciated.

Textbooks:

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, SatheeshGopi, Pearson Publications, 2009, First Edition.

Reference Books:

1. Basic Civil and Mechanical Engineering by Ommi Srikanth and M.Srinivasa Reddy, S.Chand Publications
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt.Ltd.

Web Resources:

1. https://archive.nptel.ac.in/courses/105/106/105106201/
2. https://onlinecourses.nptel.ac.in/noc23_ce18/preview
3. https://nptel.ac.in/courses/105107122

PART B: BASIC MECHANICAL ENGINEERING

Course Objectives

1	Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries and Engineering materials.
2	Explain different manufacturing processes and thermal engineering
3	Provide an overview of power plants, and mechanical transmission systems and introduce the basics of robotics and its applications.

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.	08 Hrs

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 of Electric and Hybrid Vehicles.	08 Hrs

Unit III

Power plants: Working principle of Steam, Diesel, Hydro, Nuclear power plants. Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their Applications. Introduction to Robotics - Joints & links, configurations, and applications of robotics.	08Hrs

Course Outcome:

CO1	Understand the roles of a mechanical engineer and the engineering materials.
CO2	Explain the basics of the manufacturing process and thermal engineering and its applications.
CO3	Describe the workings of power plants, different mechanical power transmission systems, and the basics of robotics and its applications.

Textbooks:

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 Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

Reference Books:

1. Basic Civil and Mechanical Engineering by Ommi Srikanth and M.Srinivasa Reddy, S.Chand

Publications
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt.Ltd.

Web Resources:

1. https://takelessons.com/en-in/mechanical-engineering
2. https://takelessons.com/en-in/mechanical-engineering

INTRODUCTION TO C-PROGRAMMING			
Subject Code	**23CMCST1050/1030**	**IA Marks**	**30**
Number of Lecture Hours/Week	**03**	**Exam Marks**	**70**
Total Number of Lecture Hours	**48**	**Exam Hours**	**03**

Credits – 03

Course Objectives:

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

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, 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.	**08 Hrs**
Unit II	
Control Structures: Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do- while) Break and Continue.	**10 Hrs**
Unit III	
Arrays and Strings: Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.	**10 Hrs**
Unit IV	
Pointers & User Defined Data types: Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types- Structures and Unions.	**10 Hrs**
Unit V	
Functions & File Handling: Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling.	**10 Hrs**

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

Text Books:

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

Reference Books

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 200
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

ENGINEERING PHYSICS			
Subject Code	**23CMPHT1020/2020**	**IA Marks**	**30**
Number of Lecture Hours/Week	**03(L)**	**Exam Marks**	**70**
Total Number of Lecture Hours	**48**	**Exam Hours**	**03**
Credits – 3			

Course Objectives:

To bridge the gap between the Physics in school at 10+2level 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.

Unit I	
Wave Optics **Interference:** Introduction - Principle of superposition –Interference of light - Interference inthin films (Reflection Geometry) & applications - Colours 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). **Polarization:** Introduction -Types of polarization -Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter waveplates.	**12 Hrs**
Unit II	
Crystallography and X-ray diffraction **Crystallography:** Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices –crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC. **X-ray diffraction:** Millerindices– separation between successive (hkl) planes. Bragg's law - X-ray Diffractometer –crystal structure determination by Laue's and powder methods.	**8 Hrs**
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 – Frequency dependence of polarization– dielectric loss. **Magnetic Materials:** Introduction – Magnetic dipole moment –Magnetization – Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferrimagnetic materials – Domain concept for Ferromagnetism & Domain walls (Qualitative) – Hysteresis –soft and hard magnetic materials.	**10 Hrs**
Unit IV	
Quantum Mechanics and Free electron Theory **Quantum Mechanics:** Dual nature of matter–Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations – Particle in a one -dimensional infinite potential well. **Free Electron Theory:** Classical free electron theory (Qualitative with discussion of	**10 Hrs**

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**: Formation of energy bands – classification of crystalline solids – Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature – Drift and diffusion currents – Einstein's equation–Hall effect and its applications.	**8 Hrs**
Course Outcomes: On completion of the course student will able to	
CO1	Analyze the intensity variation of light due to polarization, interference and diffraction.
CO2	Familiarize with the basics of crystals and their structures.
CO3	Summarize various types of polarization of dielectrics and classify the magnetic materials.
CO4	Apply the fundamentals of quantum mechanics in the study of electron transport mechanism of metals.
CO5	Explain the basic concepts of semiconductors and identify the type of semiconductor using Hall effect.
Textbooks: 1. A Text book of Engineering Physics, M.N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019. 2. Engineering Physics - D.K.Bhattacharya and PoonamTandon,Oxford press(2015)	
Reference Books: 1. Ch. Srinivas, Ch. Seshubabu, Engineering Physics, Cengage learning. 2. Engineering Physics -B.K.Pandey and S.Chaturvedi, Cengage Learning 2021. 3. Engineering Physics –Shatendra Sharma, Jyotsna Sharma, Pearson Education,2018. 4. Engineering Physics"-Sanjay D.Jain, D.Sahasrabudhe and Girish, UniversityPress.2010 5. Engineering Physics - M.R.Srinivasan, New Age internationa l publishers (2009).	
Web Resources : 1. http://vlab.amrita.edu/index.php - Virtual Labs, Amrita University	

BASIC ELECTRICAL & ELECTRONICS ENGINEERING			
Subject Code	**23CMEET1040**	**IA Marks**	**30**
Number of Lecture Hours/Week	**3L**	**Exam Marks**	**70**
Total Number of Lecture Hours	**48**	**Exam Hours**	**03**
Credits-03			

PARTA: BASIC ELECTRICAL ENGINEERING

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.

Unit -1	
DC & AC Circuits **DC Circuits:** Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems. **AC Circuits:** A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).	**7 Hrs**
Unit -2	
Machines and Measuring Instruments **Machines:** Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor 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.	**8 Hrs**
Unit – 3	
Energy Resources, Electricity Bill & Safety Measures **Energy Resources:** Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, 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.	**9 Hrs**

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

CO1	Describe fundamental laws, operating principles of motors/generators, MC/MI instruments.
CO2	Demonstrate the working of electrical machines, measuring instruments and power

	generation stations.
CO3	Apply mathematical tools and fundamental concepts to derive various equations related to electrical circuits and machines.
CO4	Calculate electrical load and electricity bill of residential and commercial buildings.

Text books:

1. Basic Electrical Engineering, D.C. Kulshreshtha, Tata Mc Graw 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, McGraw 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.

PARTB: BASIC ELECTRONICS ENGINEERING

Course Objectives:

To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

Unit – 1

SEMICONDUCTORDEVICES 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.	**8 Hrs**

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 (RCcoupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.	**8 Hrs**

Unit – III

DIGITAL ELECTRONICS Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess - 3 code, Graycode, 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 Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only).	**8 Hrs**

Course Outcomes:

CO 1	Analyze and distinguish the characteristics of p-n junction diode, zener diode and transistors.
CO 2	Demonstrate the working of rectifiers and amplifiers.
CO 3	Design and analyze combinational circuits and sequential circuits using Logic gates.

Textbooks:

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

Reference Books:

1. R.S.Sedha, AText book of Electronic Devices and Circuits, S.Chand &Co, 2010.
2. SantiramKal, Basic Electronics-Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R.T.Paynter, Introductory Electronic Devices & Circuits–Conventional Flow Version, Pearson Education, 2009.

COMPUTER PROGRAMMING LAB			
Subject Code	**23CMCSL1080**	**Internal Marks**	**30**
Number of Tutorial Hours/Week	**03(P)**	**External Marks**	**70**
Total Number of Practice Hours	**36**	**Exam Hours**	**03**
Credits – 1.5			

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

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.
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

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

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, null- else, 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.

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.

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.

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

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()

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.

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.

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.

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 like pointers.
CO4	Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

Textbooks:
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

PART-A: ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP			
Subject Code	23CMEEL1090/2080	Internal Marks	30
Number of Tutorial Hours/Week	03(P)	External Marks	70
Total Number of Practice Hours	36	Exam Hours	03

Credits – 1.5

Course Objectives:
To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

List of Experiments

(Any six experiments must be conducted)

1. Verification of KCL and KVL.
2. Verification of Super position theorem.
3. Measurement of Resistance using Wheatstone bridge.
4. Magnetization Characteristics of DC hunt Generator.
5. Measurement of Power and Power factor using Single-phase wattmeter.
6. Measurement of Earth Resistance using Megger.
7. Calculation of Electrical Energy for Domestic Premises.

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

CO1	Measure voltage, current and power in an electrical circuit.
CO2	Measure of Resistance using Wheatstone bridge
CO3	Discover critical field resistance and critical speed of DC shunt generators.
CO4	Investigate the effect of reactive power and power factor in electrical loads.

PART-B: ELECTRONICS ENGINEERING LAB

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

List of Experiments

(Any six experiments must be conducted)

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 fillip flops using respective ICs .

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

CO 1	Identify & testing of various electronic components
CO 2	Understand the usage of electronic measuring instruments.
CO 3	Plot and discuss the characteristics of various electron devices.
CO 4	Explain the operation of a digital circuit.

Engineering Graphics			
Subject Code	23CMMET1050/2040	IA Marks	30
Number of Lecture Hours/ Week	01+04	Exam Marks	70
Total Number of Lecture Hours	70	Exams Hours	03
Credits: 3			

Course Objectives

1. To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
2. To impart knowledge on the projection of points, lines and plane surfaces
3. To improve the visualization skills for better understanding of projection of solid
4. To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
5. To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

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.	14Hrs
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.	14 Hrs
Unit III	
Projections of Solids: Types of solids, Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane e, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.	14 Hrs
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	14 Hrs
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	14 Hrs

Transformations using Auto CAD (Not for end examination).	

Course Outcome:

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	Understand and draw projection of solids in various positions in first quadrant.
CO4	Explain principles behind development of surfaces.
CO5	Prepare isometric and perspective sections of simple solids and understanding the autocad.

Textbooks:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 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, DhananjayJolhe, Tata McGraw Hill, 2017.

Web Resources:

1. https://nptel.ac.in/courses/112103019
2. https://archive.nptel.ac.in/courses/112/102/112102304/

COMMUNICATVIE ENGLISH LAB			
Subject Code	**23CMEGL1060/2060**	**IA Marks**	**30**
Number of Practical Hours/Week	**02**	**Exam Marks**	**70**
Total Number of Practical Hours	**32**	**Exam Hours**	**02**

Course Objective:

1	Develop a holistic understanding of English language proficiency encompassing Listening, Speaking, Reading, and Writing (LSRW) skills.
2	Apply effective communication skills through a variety of language learning activities
3	Analyze English speech sounds, stress patterns, rhythm, intonation, and syllable division to enhance both listening and speaking comprehension.
4	Evaluate and demonstrate professionalism in engaging in debates and group discussions
5	Enhance the ability to create effective communication in various contexts, both orally and in writing.

Course Objectives:

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

List of Topics/Experiments: Vowels & Consonants ,Neutralization/Accent Rules Communication Skills & JAM .Role Play or Conversational Practice ,E-mail Writing
Resume Writing, Cover letter, SOP ,Group Discussions-methods & practice
Debates - Methods & Practice, PPT Presentations/ Poster Presentation Interviews Skill

Suggested Software: Walden Infotech ,Young India Films

Course Outcomes:

CO 1	Understand the different aspects of the English language proficiency with emphasis on LSRW skills.
CO 2	Apply communication skills through various language learning activities.
CO 3	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
CO 4	Evaluate and exhibit professionalism in participating in debates and group discussions.
CO 5	Create effective Course Objectives:

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

CHEMISTRY LABORATORY			
(Proposed syllabus for the academic year 2023-24)			
Subject Code	**23EECHL1070**	**IA Marks**	**30**
Number of Periods/Week	**03**	**Exam Marks**	**70**
Total Number of Practice Hours	**36**	**Exam Hours**	**02**
Credits – 1.0			

Course Objectives:

1	Determine the strength of acids using conductivity meter.
2	Determine amount of Fe (II) using potentiometer.
3	Familiarize the synthesis of a condensed polymer and nanomaterials
4	Acquire knowledge on volumetric analysis
5	Interpret pH and cell constant

List of Experiments

(Any 10 experiments must be conducted)

1. Conductometric titration of strong acid vs. strong base
2. Conductometric titration of weak acid vs. strongbase
3. Determination of cell constant and conductance of solutions
4. Potentiometry – determination of redox potentials and emfs
5. Potentiometric titration of strong acid vs. strong base
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. Determination of pH of the given samples using pH-meter
11. Preparation of nanomaterials by precipitation method
12. Estimation of Ferrous Iron by Dichrometry
13. Estimation of Potassium permanganate using oxalic acid
14. Determination of Calcium by complexometry

Demonstration Experiments

15. Thin Layer Chromatography
16. Determination of $Fe^{+3}$by a colorimetric method.

Course Outcomes

CO1	Able to determine the strength of acids using conductivity meter.
CO2	Able to find the amount of Fe (II) using potentiometer.
CO3	Able to synthesize Bakelite and nanoparticles using UV spectrophotometer
CO4	Able to determine the strength of a compound by volumetric analysis
CO5	Able to interpret pH and cell constant

ENGINEERING WORKSHOP			
Subject Code	**23CMMEL1090/2080**	**IA Marks**	**30**
Number of Lecture Hours/ Week	**03 hours**	**Exam Marks**	**70**
Total Number of Lecture Hours	**36 hours**	**Exams Hours**	**03**
Credits: 1.5			

Course Objectives:

To familiarize students with wood working, sheet metal operations, fitting, electrical house wiring skills and basic repairs of two-wheeler vehicle.

List of Exercises / Experiments (Minimum of 12 mandatory)

S.No.	Trade Name	Experiment
1	Demonstration	Safety practices and precautions to be observed in workshop
2	Wood Working/ Carpentry	Familiarity with different types of wood and tools used in wood working 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 metal working, Developments of following sheet metal job from G.Isheets. a) Tapered tray b) Conical funnel c) Elbow pipe d)Brazing
4	Fitting	Familiarity with different types of tools used in fitting and do the following fitting exercises. a) V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture
5	Electrical Wiring	Familiarity with different types of basic electrical circuits and makes the following connections. a) Parallel and series b)Two-way switch c) Go down lighting d) Tube light e) Three phase motor f) Soldering of wires
6	Foundry Trade	Demonstration and practice on Moulding tools and processes, Preparation of Green S and 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.

Course Outcome:

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

Text books:

1. Basic Workshop Technology: Manufacturing Process,FelixW.; 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. Workshop manual / p. Kannaiah/ K.L. Narayana/sci Tech publishers
2. Workshop technology: part1 and part 3 by W.A.J Chapman, S.J Martin
3. Workshop Practice manual by K.Venkatreddy , B.S. Publications

ENGINEERING CHEMISTRY			
Subject Code	**23CECHT2030/23MECHT2030**	**IA Marks**	**30**
Number of Lecture Hours/Week	**03**	**Exam Marks**	**70**
Total Number of Lecture Hours	**48**	**Exam Hours**	**03**
Credits – 03			

Course Objectives:	
1.	To Impart the concept of soft and hard water, softening methods of hard water.
2.	To Train the students on the principles and applications of electrochemistry, polymers, surface chemistry and cement
3.	To Familiarize modern engineering materials

Unit I	
Water Technology Soft and hard water, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen – Boiler troubles **–**Priming, foaming**,** scale and sludge, Caustic embrittlement, Industrial water treatment –Specifications for drinking water, Bureau of Indian Standards (BIS) and World health organization (WHO) standards, Ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.	**9 Hrs**
Unit II	
Electrochemistry and Applications Electrodes – electrochemical cell, Nernst equation, cell potential calculations. Primary cells – Zinc-air battery, Secondary cells – Nickel -Cadmium (NiCad), and lithium ion batteries – working principle of the batteries including cell reactions; Fuelcells – Basic Concepts, the principle and working of hydrogen-oxygen Fuel cell. Corrosion: Introduction to corrosion, electrochemical theory of corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, Corrosion control methods – Control by proper design**,** cathodic and anodic protection - electroplating and electroless plating (Nickel and Copper).	**10 Hrs**
Unit III	
Polymers and Fuel Chemistry Introduction to polymers, functionality of monomers, Tacticity, Mechanism of free radical chain growth polymerization. Thermoplastics and Thermo - setting plastics: Preparation, properties and applications of polystyrene. PVC Nylon 6,6 and Bakelite. Elastomers – Preparation, properties and applications of Buna-S, Buna-N, Thiokol rubbers. Fuels **–** Types of fuels, calorific value of fuels, numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane and Cetane number – alternative fuels -propane, methanol, ethanol and bio fuel-bio diesel.	**10 Hrs**

Unit IV		
Modern Engineering Materials Composites- Definition, Classification- Particle, Fibre reinforced composites, properties and Engineering applications. Refractories - Classification, Properties, Factors affecting the refractory materials and Applications. Lubricants - Classification, Functions of lubricants, Properties of lubricating oils –Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, Saponification and Applications. Building materials – Manufacturing of Portland Cement, Constituents, Setting and Hardening of cement.		**10 Hrs**
Unit V		
Surface Chemistry and Nanomaterials Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, chemical methods of preparation of nano metals by Chemical reduction method and metal oxides by Sol-gel method, stabilization of colloids and nanomaterials by stabilizing agents, adsorption isotherm (Freundlich and Longmuir), BET equation (no derivation) applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.		**10 Hrs**
Course Outcomes: On completion of the course student will be able to		
CO1	Interpret the various problems faced in industries due to boiler troubles.	
CO2	Demonstrate the corrosion prevention methods and factors affecting corrosion	
CO3	Outline the preparation, properties and applications of thermoplastics &thermosetting, elastomers & conducting polymers.	
CO4	Explain calorific values, octane number, refining of petroleum and cracking of oils.	
CO5	Outline the setting and hardening of cement.	
CO6	Summarize the concepts of colloids, micelle and nanomaterials.	

Text Books:

1. P.C. Jain and M. Jain "**Engineering Chemistry**", 15/e, Dhanpat Rai & Sons, Delhi, (Latest edition).
2. Fundamentals of Molecular Spectroscopy, by C. N. Banwell.
3. Peter Atkins, Juliode Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. H.F.W.Taylor, Cement Chemistry, 2/e, Thomas Telford Publications,1997.
2. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth - Heineman, 1992.
3. Text book of Polymer Science, Fred W.Billmayer Jr, 3rd Edition

ENGINEERING MECHANICS			
Subject Code	**23CECET2050/ 23MEMET2050**	**Internal Marks**	**30**
Number of Lecture Hours / Week	**03**	**External Marks**	**70**
Total Number of Lecture Hours	**48**	**Exam Hours**	**100**
Credits – 03			

Course Objectives:

1. To get familiarized with different types of force systems.
2. To draw accurate free body diagrams representing forces and moments acting on a body to analyze the equilibrium of system of forces.
3. To teach the basic principles of center of gravity, centroid and moment of inertia and determine them for different simple and composite bodies.
4. To apply the Work-Energy method to particle motion.
5. To understand the kinematics and kinetics of translational and rotational motion of rigid bodies.

Unit-1 Introduction to Engineering Mechanics	**Hrs**
– Basic Concepts. Scope and Applications **Systems of Forces:** Coplanar Concurrent Forces– Components in Space–Resultant–Moment of Force and its Application –Couples and Resultant of Force Systems. **Friction:** Introduction**,** limiting friction and impending motion, Coulomb'slaws of dryfriction, coefficient of friction, Cone of Static friction.	**10**
Unit-2 Equilibrium of Systems of Forces	
: Free Body Diagrams, Lami'sTheorm, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses. Principle of virtual work with simple examples	10
Unit-3	
Centroid: Centroids of simple figures (from basic principles)–Centroids of Composite Figures. **Centre of Gravity:** Centre of gravity of simple body (from basic principles), Centre of gravity of composite bodies, Pappus theorems. **Area Moments of Inertia:** Definition– Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of Inertia:** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, Mass Moment of Inertia of composite bodies.	10
Unit-4 Rectilinear and Curvilinear motion of a particle	
Kinematics and Kinetics –D'Alembert's Principle - Work Energy method and applications to particle motion-Impulse Momentum method.	9
Unit-5 Rigid body Motion	
Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method.	9

Course Outcomes:

On Completion of the course, the student should be able to

1. Understand the fundamental concepts in mechanics and determine the frictional forces for bodies in contact.
2. Analyze different force systems such as concurrent, coplanar and spatial systems and calculate their resultant forces and moments.
3. Calculate the centroids, center of gravity and moment of inertia of different geometrical shapes.
4. Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle.
5. Solve the problems involving the translational and rotational motion of rigid bodies.

Text Books:

1. Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., , McGraw Hill Education 2017. 5th Edition.
2. Engineering Mechanics, P.C.Dumir- S.Sengupta and Srinivas V veeravalli , University press. 2020. First Edition.
3. A Textbook of Engineering Mechanics, S.S Bhavikatti. New age international publications 2018. 4th Edition.

References:

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education. 2017. First Edition.
2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., PHI, 2002. 4th Edition.
3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L. G. Kraige., John Wiley, 2008. 6th Edition.
4. Introduction to Statics and Dynamics, BasudevBattachatia, Oxford University Press, 2014. Second Edition
5. Engineering Mechanics: Statics and Dynamics, Hibbeler R.C., Pearson Education, Inc., New Delhi, 2022, 14th Edition

Question Paper Pattern:

SECTION A:

1. This section contains ten questions carrying 2 mark each.
2. Two questions from each unit should present.

SECTION B:

1. This section will have 5 questions with internal choice.
2. Each full question carries 10 marks.

Each full question may have sub question covering all topics under a unit.

DATA STRUCTURES			
Subject Code	23AMAMT2050/23CACAT2050/ 23CICIT2050/23CDCDT2050/ 23CSCST2050/23CTCTT2050/ 23ITITT2050	IA Marks	30
Number of Lecture Hours/Week	03	Exam Marks	70
Total Number of Lecture Hours	48	Exam Hours	03

Credits – 03

Course Objectives:

1.	To provide the knowledge of basic data structures and their implementations.
2.	To understand importance of data structures in context of writing efficient programs.
3.	To develop skills to apply appropriate data structures in problem solving.

Unit I	
Introduction to Linear Data Structures: Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures. Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Insertion Sort	**8 Hrs**
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.	**10 Hrs**
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	**10 Hrs**
Unit IV	
Queues: Introduction to queues: properties and operations, implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc. **Deques:** Introduction to deques (double-ended queues), Operations on deques and their applications.	**10 Hrs**
Unit V	
Trees: Introduction to Trees, Binary Search Tree – Insertion, Deletion & Traversal **Hashing: Brief** introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.	**10 Hrs**
Course Outcomes:	

CO1	Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
CO2	Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
CO3	Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
CO4	Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between deques and priority queues, and apply them appropriately to solve data management challenges
CO5	Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.

CO6	Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

Text Books:

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

ELECTRICAL CIRCUIT ANALYSIS-I			
Subject Code	**23EEEET2050**	**IA Marks**	**30**
Number of Lecture Hours/Week	**03**	**Exam Marks**	**70**
Total Number of Lecture Hours	**48**	**Exam Hours**	**03**
Credits – 03			

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

Unit I	
INTRODUCTION TO ELECTRICAL CIRCUITS Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent andindependent), 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.	**10 Hrs**
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.	**10 Hrs**
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, parallel RC circuit.	**10 Hrs**
Unit IV	
RESONANCE AND LOCUS DIAGRAMS Series Resonance: Characteristics of a series resonant circuit, Q - factor, selectivity and band width, expression for half power frequencies; Parallel resonance: Q-factor, selectivity and band width; Locus diagram: RL, RC, RLC with R,L and C variables.	**9 Hrs**
Unit V	
NETWORK THEOREMS (DC & AC EXCITATIONS) Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's the oremand compensation theorem.	**9 Hrs**
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 graphical representations.
CO4	Analyse nodal and mesh networks, series and parallel circuits, steady state response, different circuit topologies (with R, L andC components).
CO5	Evaluation of Network theorems, electrical, magnetic and single-phase circuits.

Text Books:

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

Reference Books:

1. Fundamentals of Electrical Circuits, Charles K.Alexander and Mathew N.O.Sadiku, Mc Graw Hill Education (India), 2013, Fifth Edition.
2. Electric Circuits (Schaum's outline Series), Mahmood Nahvi, Joseph Ed minister 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.

ENGINEERING PHYSICS LAB			
Subject Code	**23CMPHL1070/ 23CMPHL2060**	**IA Marks**	**30**
Number of Practice Hours/Week	**02**	**Exam Marks**	**70**
Total Number of Practice Hours	**14**	**Exam Hours**	**02**
Credits – 1.0			

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.

List of Experiments

1. Determination of radius of curvature of agiven Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines inmercury spectrum using diffraction grating in normal incidence configuration.
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 to fagiven 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 susceptibility 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. Determination of Fermi energy of Copper by using meter bridge

COURSE OUTCOMES:

On completion of the course student willable to

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 the physical quantities like frequency, dielectric constant, Planck's constant and acceleration due to gravity

CO5: Calculate the band gap and resistivity of a given semiconductor.

CO6: Identify the type of semiconductor using Hall effect.

TEXT BOOKS:

"*Physics Laboratory Manual"* Prepared by Department of Physics, SITE.

REFERENCE BOOKS:

1. S. Balasubrahmanian, M.N. Srinivasan ''A Text book of Practical Physics''- S. Chand Publishers, 2017.
2. Advanced Practical Physics Vol 1& 2 SP Singh & M.S Chauhan Pragati Prakashan, Meerut

WEB SOURCES:

www.vlab.co.in

https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

IT WORKSHOP			
Subject Code	23CMCSL1060/2070	Internal Marks	30
Number of Tutorial Hours/Week	03(P)	External Marks	70
Total Number of Practice Hours	36	Exam Hours	03
Credits – 1.5			

Course Objectives:

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

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.

Task2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

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

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

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

Task2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, book marks, search tool bars and popup blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task3: 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 activex 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 LaTeX 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 LaTeX and word –Accessing, overview of tool bars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX 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 LaTeX and Word.
Task 3: Creating project abstract Features to be covered:- Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cellalignment, Foot note, Hyperlink, Symbols, Spell Check, Track Changes.
Task4: 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 Spread sheet tool, give the details of the four tasks and features that would be covered in each. Using Excel–Accessing, overview of tool bars, saving excel files, Using help and resources.
Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, autofill, 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
POWERPOINT
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, WordArt, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in Power Point.
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, slideslotter, notesetc) and Inserting –Background, textures, Design Templates, Hidden slides.
AI TOOLS –Chat GPT
Task1: 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 area knowledgeable AI. Please answer the following question: What is the capital of France?"

Task2: 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 brain storm creative ideas

- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating up wards. Writeastory 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?'"

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

ReferenceBooks::

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 KenQuamme. – CISCO Press, Pearson Education, 3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCOPress, Pearson Education, 3rd edition

ENGINEERING CHEMISTRY LABORATORY			
Subject Code	23CECHL2070/ 23MECHL2070	IA Marks	30
Number of Periods/Week	03	Exam Marks	70
Total Number of Practice Hours	36	Exam Hours	02

Credits – 1.0

Course Objectives: The objectives of this course, help the students to

1.	Determine the viscosity of given sample.
2.	Determine amount of Fe and calcium in cement.
3.	Familiarize the synthesis of a condensed polymer.
4.	Acquire knowledge on volumetric analysis
5.	Interpret Cloud and Pour point of oil

List of Experiments

(Any 10 experiments must be conducted)

1. Determination of Hardness of ground water sample.
2. Estimation of Dissolved Oxygen by Winkler's method
3. Determination of alkalinity of a sample containing Na2CO3 and NaOH
4. Determination of surface tension of given liquid
5. Determination of Strength of an acid in Pb-Acid battery
6. Preparation of a polymer (Bakelite)
7. Determination of percentage of Iron in Cement sample by colorimetry
8. Estimation of Calcium in Portland Cement
9. Preparation of nano materials by precipitation method.
10. Adsorption of acetic acid by charcoal
11. Determination of Chloride by argentometry.
12. Determination of Viscosity of lubricating oil by Redwood Viscometer1
13. Determination of Viscosity of lubricating oil by Redwood Viscometer2
14. Determination of Cloud and Pour point of oil.

Demonstration Experiments

15. Thin Layer Chromatography
16. Determination of Ferrous iron using potentiometer.

Course Outcomes: On completion of the course student will be

CO1	Able to determine the viscosity of given sample
CO2	Able to find the amount of Fe and calcium in cement.
CO3	Able to synthesize Bakelite.
CO4	Able to determine the hardness, chloride content and alkalinity by volumetric analysis
CO5	Able to interpret Cloud and Pour point of oil

NETWORK ANALYSIS AND SIMULATION LABORATORY			
Subject Code	**23ECECL2090/23ETETL2090**	**Internal Marks**	**30**
Number Lecture Hr/	**03**	**External Marks**	**70**
Total No Hr	**36**	**Exam Hours**	**03**
Credits – 1.5			

Course Objectives:

This course will enable students to

1. To gain hands on experience in verifying Kirchoff's laws and network theorems
2. To analyze transient behavior of circuits
3. To study resonance characteristics
4. To determine 2-port network parameters

List of Experiments:

The following experiments need to be performed using both Hardware and simulation Software

The experiments need to be simulated using software and the same need to be verified using the hardware.

1. Study of components of a circuit and Verification of KCL and KVL.
2. Verification of mesh and nodal analysis for AC circuits
3. Verification of Superposition, Thevenin's& Norton theorems for AC circuits
4. Verification of maximum power transfer theorem for AC circuits
5. Verification of Tellegen's theorem for two networks of the same topology.
6. Study of DC transients in RL, RC and RLC circuits
7. To study frequency response of various 1st order RL & RC networks
8. To study the transient and steady state response of a 2nd order circuit by varying its various parameters and studying their effects on responses
9. Find the Q Factor and Bandwidth of a Series and Parallel Resonance circuit.
10. Determination of open circuit (Z) and short circuit (Y) parameters
11. Determination of hybrid (H) and transmission (ABCD) parameters
12. To measure two port parameters of a twin-T network and study its frequency response

Course outcomes:

On completion of the course student will be able to

1. Verify Kirchoff's laws and network theorems.
2. Measure time constants of RL & RC circuits.
3. Analyze behavior of RLC circuit for different cases.
4. Design resonant circuit for given specifications.
5. Characterize and model the network in terms of all network parameters

References:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.

2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9th Edition 2020.

ELECTRICAL CIRCUITS LAB			
Subject Code	**23EEEEL2090**	**IA Marks**	**30**
Number of Lecture Hours/Week	**3P**	**Exam Marks**	**70**
Total Number of Lecture Hours	**36**	**Exam Hours**	**03**
Credits-1.5			

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.

List of Experiments

(Any ten experiments must be conducted)

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 Parameter sofa 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 Super position theorem
10. Verification of Thevenin's and Norton's Theorems
11. Verification of Maximum power transfer theorem
12. Verification of Compensation theorem
13. Verification of Reciprocity and Millman's Theorems

COURSE OUTCOMES: On completion of the course student will be able to:

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.

ENGINEERING MECHANICS & BUILDING PRACTICES LAB			
Subject Code	**23CECEL2090**	**IA Marks**	**30**
Number of Lecture Hours/Week	**3P**	**Exam Marks**	**70**
Total Number of Lecture Hours	**36**	**Exam Hours**	**03**
Credits-1.5			

Course Objectives:

1. To verify the Law of Parallelogram of Forces and Lami's theorem

2. To determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina.

3. To understand the layout of a building, concepts of Non-Destructive Testing and different Alternative Materials.

List of Experiments

(Any ten experiments must be conducted)

1. To study various types of tools used in construction.
2. Forces in Pin Jointed Trusses
3. Experimental Proof of Lami's Theorem
4. Verification of Law of Parallelogram of Forces.
5. Determination of Center of Gravity of different shaped Plane Lamina.
6. Determination of coefficient of Static and Rolling Friction.
7. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever
8. Study of Alternative Materials like M-sand, Fly ash, Sea Sand etc.
9. Field-Visit to understand the Quality Testing - report.
10. Safety Practices in Construction industry
11. Demonstration of Non-Destructive Testing - using Rebound Hammer & UPV
12. Study of Plumbing in buildings.

COURSE OUTCOMES: On completion of the course student will be able to:

CO1: Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller.

CO2: Verify Law of Parallelogram of forces and Law of Moment using force polygon and bell crank lever. CO3: Determine the Centre of gravity different configurations and

CO3: Determine the Centre of gravity different configurations

CO4: Understand the Quality Testing and Assessment Procedures and principles of Non-Destructive Testing.

CO5: Exposure to safety practices in the construction industry.

DATA STRUCTURES LAB			
Subject Code	23AMAML2090/23CICIL2090 23CDCDL2090/23CSCSL2090/ 23CACAL2090/23CTCTL2090/ 23ITITL2090	Internal Marks	30
Number of Tutorial Hours/Week	03(P)	External Marks	70
Total Number of Practice Hours	36	Exam Hours	03
Credits – 1.5			

Course Objectives:

The course aims to strengthen the ability of the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

List of Experiments:

Exercise 1: Array Manipulation

i) Write a program to reverse an array.
ii) C Programs to implement the Searching Techniques – Linear & Binary Search
iii) C Programs to implement Sorting Techniques – Bubble, Selection and Insertion Sort

Exercise 2: Linked List Implementation

i) Implement a singly linked list and perform insertion and deletion operations.
ii) Develop a program to reverse a linked list iteratively and recursively.
iii) Solve problems involving linked list traversal and manipulation.

Exercise 3: Linked List Applications

i) Create a program to detect and remove duplicates from a linked list.
ii) Implement a linked list to represent polynomials and perform addition.
iii) Implement a double-ended queue (deque) with essential operations.

Exercise 4: Double Linked List Implementation

i) Implement a doubly linked list and perform various operations to understand itsproperties and applications.
ii) Implement a circular linked list and perform insertion, deletion, and traversal.

Exercise 5: Stack Operations

i) Implement a stack using arrays and linked lists.
ii) Write a program to evaluate a postfix expression using a stack.
iii) Implement a program to check for balanced parentheses using a stack.

Exercise 6: Queue Operations

i) Implement a queue using arrays and linked lists.
ii) Develop a program to simulate a simple printer queue system.
iii) Solve problems involving circular queues.

Exercise 7: Stack and Queue Applications

i) Use a stack to evaluate an infix expression and convert it to postfix.
ii) Create a program to determine whether a given string is a palindrome or not.
iii) Implement a stack or queue to perform comparison and check for symmetry.

Exercise 8: Binary Search Tree

i) Implementing a BST using Linked List.
ii) Traversing of BST.

Exercise 9: Hashing

i) Implement a hash table with collision resolution techniques.
ii) Write a program to implement a simple cache using hashing

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

CO1: Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
CO2: Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
CO3: Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
CO4: Apply queue-based algorithms for efficient task scheduling and breadth-first traversal ingraphs and distinguish between deques and priority queues and apply them appropriately to solve data management challenges.
CO5: Recognize scenarios where hashing is advantageous, and design hash-based solutions forspecific problems.

Textbooks:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Silicon Press, 2008

Reference Books:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and PeterSanders
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 DavidRanum
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.

ENGINEERING MECHANICS LAB			
Subject Code	**23MEMEL2090**	**IA Marks**	**30**
Number of Lecture Hours/Week	**03**	**Exam Marks**	**70**
Total Number of Lecture Hours		**Exam Hours**	**100**
Credits –1.5			

Course Objectives:

The students completing the course are expected to:

1. Verify the Law of Parallelogram and Triangle of Forces.
2. Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina.
3. Analyze the system of Pulleys and Moment of Inertia of Compound Pendulum and Flywheel.

List of Experiments:

1. Verification of Law of Parallelogram of Forces.
2. Verification of Law of Triangle of Forces.
3. Verification of the Law of polygon for coplanar-concurrent forces acting on a particle in equilibrium and to find the value of unknown forces considering particle to be in equilibrium using universal force table.
4. Determination of coefficient of Static and Rolling Frictions
5. Determination of Centre of Gravity of different shaped Plane Lamina.
6. Verification of the conditions of equilibrium of a rigid body under the action of coplanar non-concurrent, parallel force system with the help of a simply supported beam.
7. Study of the systems of pulleys and draw the free body diagram of the system.
8. Determine the acceleration due to gravity using a compound pendulum.
9. Determine the Moment of Inertia of the compound pendulum about an axis perpendicular to the plane of oscillation and passing through its centre of mass.
10. Determine the Moment of Inertia of a Flywheel.
11. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever.

Students have to perform any 10 of the following Experiments:

Course outcomes:

1. Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller.
2. Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever.
3. Determine the Centre of gravity and Moment of Inertia of different configurations.
4. Verify the equilibrium conditions of a rigid body under the action of different force systems.

HEALTHAND WELLNESS, YOGA AND SPORTS			
Subject Code	**23CMPES1100/2100**	**Internal Marks**	**-**
Number of Lecture Hours/Week	**01**	**External Marks**	**100**
Total Number of Lecture Hours	**00**	**Exam Hours**	**03**
Credits – 0.5			

Course Objectives:

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

Unit -1	**Hours**
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	**5**
Unit -2	
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	**5**
Unit – 3	
Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Common wealth games. **Activities:** i) Participation in one major game and one individual sport viz., Athletics, Volley ball, Basket ball, Hand ball, Foot ball, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc. Practicing general and specific warm up, aerobics. ii) Practicing cardio respiratory fitness, tread mill, run test, 9 min walk, skipping and running.	**5**
Total	**15**

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

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 Hand book: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paper backs, 2014
5. The Sports Rules Book/Human Kinetics with Thomas Hanlon.--3rd ed. Human Kinetics, Inc. 2014

NSS/NCC/SCOUTS&GUIDES/COMMUNITYSERVICE			
Subject Code	**23CMNSNS1100/2100**	**Internal Marks**	**-**
Number of Lecture Hours/Week	**01**	**External Marks**	**100**
Total Number of Lecture Hours	**00**	**Exam Hours**	**03**
Credits – 0.5			

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.

Unit -1	**Hours**
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 talents and skills ii) Conducting orientations programs for the students –future plans – activities – releasing road map 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.	**5**
Unit -2	
Community &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) Organising 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.	**5**
Unit – 3	
Community Services i) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS, ii) Conducting consumer Awareness. Explaining various legal provisions etc. iii) Women Empowerment Programmes-Sexual Abuse, Adolescent Health and Population Education. iv) Any other programmes in collaboration with local charities, NGOs etc. **Activities:**	**5**

Conducting One Day Special Camp in a village contacting village-area leaders-Survey in the village, identification of problems- helping them to solve via media- authorities-experts-etc.	
Total	**15**

Course outcomes: After completion of the course the students will be

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 down trodden people.

CO5: Develop leadership skills and civic responsibilities.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme.* Vol;.I, Vidya Kutir Publication, 2021(ISBN978-81-952368-8-6)
2. *Red Book – National Cadet Corps*–Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, NewDelhi
3. Davis M.L. and Cornwell D.A., "Introduction to Environmental Engineering", McGraw Hill, New York4/e 2008
4. Masters G.M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e2007
5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

COURSE STRUCTURE AND SYLLABUS FOR
III & IV SEMESTER
SITE-23 REGULATIONS

Course Structure for II B. Tech I Semester Under the Regulations of SITE-23							
III SEMESTER							
S. No	**Course Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	BS	23CMMAT3010	Complex Variables & Numerical Methods	3	0	0	3
2	HSMC	23CMEET3020	Universal human values – understanding harmony and Ethical human conduct	2	1	0	3
3	ES	23EEEET3030	Electromagnetic Field Theory	3	0	0	3
4	PC	23EEEET3040	Electrical Circuit Analysis-II	3	0	0	3
5	PC	23EEEET3050	DC Machines & Transformers	3	0	0	3
6	PC LAB	23EEEEL3060	Electrical Circuit Analysis-II and Simulation Lab	0	0	3	1.5
7	PC LAB	23EEEEL3070	DC Machines & Transformers Lab	0	0	3	1.5
8	SOC	23SOCTI3080	Data Structures Lab	0	1	2	2
9	AC	23EEMN3090	Environmental Science	2	0	0	-
Total				**15**	**2**	**8**	**20**

Course Structure for II B. Tech II Semester Under the Regulations of SITE-23							
IV SEMESTER							
S. No	**Course Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	MS	23EEMST4010	Managerial Economics & Financial Analysis	2	0	0	2
2	ES/BS	23EEEET4020	Analog Circuits	3	0	0	3
3	PC	23EEEET4030	Power Systems-I	3	0	0	3
4	PC	23EEEET4040	Induction and Synchronous Machines	3	0	0	3
5	PC	23EEEET4050	Control Systems	3	0	0	3
6	PC	23EEEEL4060	Induction and Synchronous Machines Lab	0	0	3	1.5
7	PC	23EEEEL4070	Control Systems Lab	0	0	3	1.5
8	SOC	23SOCTI4080	Python Programming Lab	0	1	2	2
9	ES	23EEMS4090	Design Thinking & Innovation	1	0	2	2
Total				**15**	**1**	**10**	**21**

Course Structure for II B. Tech I Semester Under the Regulations of SITE-23							
III SEMESTER							
S. No	Course Category	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	BS	23CMMAT3010	Complex Variables & Numerical Methods	3	0	0	3
2	HSMC	23CMEET3020	Universal human values – understanding harmony and Ethical human conduct	2	1	0	3
3	ES	23EEEET3030	Electromagnetic Field Theory	3	0	0	3
4	PC	23EEEET3040	Electrical Circuit Analysis-II	3	0	0	3
5	PC	23EEEET3050	DC Machines & Transformers	3	0	0	3
6	PC LAB	23EEEEL3060	Electrical Circuit Analysis-II and Simulation Lab	0	0	3	1.5
7	PC LAB	23EEEEL3070	DC Machines & Transformers Lab	0	0	3	1.5
8	SOC	23SOCTI3080	Data Structures Lab	0	1	2	2
9	AC	23EEMN3090	Environmental Science	2	0	0	-
Total				**15**	**2**	**8**	**20**

COMPLEX VARIABLES & NUMERICAL METHODS SEMESTER - II/I			
Subject Code	**23CMMAT3010**	**IA Marks**	**30**
Number of Lecture Hours/Week	**3**	**Exam Marks**	**70**
Total Number of Lecture Hours	**48**	**Exam Hours**	**03**
Credits – 03			

Course Objectives:

1. To elucidate the different numerical methods to solve nonlinear algebraic equations
2. To disseminate the use of different numerical techniques for carrying out numerical integration.
3. To familiarize the complex variables.
4. To equip the students to solve application problems in their disciplines.

Unit -1	
Iterative Methods: Introduction – Solutions of algebraic and transcendental equations: Bisection method – Secant method – Method of false position – Iteration method – Newton- Raphson method (Simultaneous Equations) **Interpolation:** Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula	**Hours – 10**
Unit -2	
Numerical integration, Solution of ordinary differential equations with initial conditions: Trapezoidal rule– Simpson's $1/3^{rd}$ and $3/8^{th}$ rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method – Runge- Kutta method (second and fourth order) – Milne's Predictor and Corrector Method.	**Hours – 10**
Unit – 3	
Functions of a complex variable and Complex integration: Introduction – Continuity – Differentiability – Analyticity –Cauchy-Riemann equations in Cartesian and polar coordinates – Harmonic and conjugate harmonic functions – Milne – Thompson method. **Complex integration:** Line integral – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula (all without proofs) and problems on above theorems.	**Hours – 10**
Unit – 4	
Series expansions and Residue Theorem: Radius of convergence – Expansion of function in Taylor's series, Maclaurin's series and Laurent series. Types of Singularities: Isolated – Essential singularities –Pole of order m– Residues – Residue theorem (without proof) – Evaluation of real integral of the types $\int_{-\infty}^{+\infty} f(x)dx$ and $\int_{c}^{2\pi+c} f(\cos\theta, \sin\theta)d\theta$	**Hours – 8**

Unit – 5

Conformal mapping:

Transformation by e^z, lnz, z^2, z^n (n positive integer), Sin z, cos z, z + a/z. Translation, rotation, inversion and bilinear transformation – fixed point - cross ratio – properties
invariance of circles and cross ratio – determination of bilinear transformation mapping 3 given points.

Hours – 10

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

1. Evaluate the approximate roots of polynomial and transcendental equations by different algorithms. Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals (L3)
2. Apply numerical integral techniques to different Engineering problems. Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations (L3)
3. Apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic (L3)
4. Evaluate the Taylor and Laurent expansions of simple functions, determining the nature of the singularities and calculating residues. Make use of the Cauchy residue theorem to evaluate certain integrals (L3)
5. Explain properties of various types of conformal mappings (L5)

Text Books:

1. **B. S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. **Micheael Greenberg,**Advanced Engineering Mathematics, 2nd edition, Pearson edition.

Reference Books:

1. **Erwin Kreyszig,**Advanced Engineering Mathematics, 10th Edition, Wiley-India.
2. **B. V. Ramana,**Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
3. **Steven C. Chapra,** Applied Numerical Methods with MATLAB for Engineering and Science,Tata Mc. Graw Hill Education.
4. **M. K. Jain, S.R.K. Iyengar and R.K. Jain,** Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
5. **J. W. Brown and R. V. Churchill**, Complex Variables and Applications, 9thedition,Mc- Graw Hill, 2013

UNIVERSAL HUMAN VALUES – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT
SEMESTER-III

Subject Code	**23CMEET3020**	**IA-Marks**	**30**
Number of Lecture Hours/Week	**2L+1T**	**Exam-Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam-Hours**	**03**
Credits -03			

Course-Objectives:

This course will enable student to:

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

Course Topics

The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1- hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions.

The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

Unit-I	**Hours**
Introduction to Value Education (6 lectures and 3 tutorials for practice session) **Lecture 1:** Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) **Lecture 2:** Understanding Value Education **Tutorial 1:** Practice Session PS1 Sharing about Oneself **Lecture 3:** self-exploration as the Process for Value Education **Lecture4:** Continuous Happiness and Prosperity – the Basic Human Aspirations **Tutorial 2:** Practice Session PS2 Exploring Human Consciousness **Lecture 5:** Happiness and Prosperity – Current Scenario **Lecture 6:** Method to Fulfill the Basic Human Aspirations **Tutorial 3:** Practice Session PS3 Exploring Natural Acceptance	**10**
Unit-II	
Harmony in the Human Being (6 lectures and 3 tutorials for practice session) **Lecture 7:** Understanding Human being as the Co-existence of the self and the body. **Lecture 8:** Distinguishing between the Needs of the self and the body	**08**

Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body. **Lecture 9:** The body as an Instrument of the self. **Lecture 10**: Understanding Harmony in the self **Tutorial 5:** Practice Session PS5 Exploring Sources of Imagination in the self **Lecture 11:** Harmony of the self with the body **Lecture 12:** Programme to ensure self-regulation and Health **Tutorial 6:** Practice Session PS6 Exploring Harmony of self with the body	
Unit-III	
Harmony in the Family and Society (6 lectures and 3 tutorials for practice session) **Lecture 13:** Harmony in the Family – the Basic Unit of Human Interaction **Lecture 14:** 'Trust' – the Foundational Value in Relationship **Tutorial 7:** Practice Session PS7 Exploring the Feeling of Trust **Lecture 15:** 'Respect' – as the Right Evaluation **Tutorial 8:** Practice Session PS8 Exploring the Feeling of Respect **Lecture 16:** Other Feelings, Justice in Human-to-Human Relationship **Lecture 17:** Understanding Harmony in the Society **Lecture 18:** Vision for the Universal Human Order **Tutorial 9:** Practice Session PS9 Exploring Systems to fulfil Human Goal	**07**
Unit-IV	
Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session) **Lecture 19:** Understanding Harmony in the Nature **Lecture 20:** Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature **Tutorial 10:** Practice Session PS10 Exploring the Four Orders of Nature **Lecture 21:** Realizing Existence as Co-existence at All Levels **Lecture 22:** The Holistic Perception of Harmony in Existence **Tutorial 11:** Practice Session PS11 Exploring Co-existence in Existence.	**10**
Unit-V	
Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session) **Lecture 23:** Natural Acceptance of Human Values Lecture 24: Definitiveness of (Ethical) Human Conduct **Tutorial 12:** Practice Session PS12 Exploring Ethical Human Conduct **Lecture 25:** A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order **Lecture 26:** Competence in Professional Ethics **Tutorial 13:** Practice Session PS13 Exploring Humanistic Models in Education **Lecture 27:** Holistic Technologies, Production Systems and Management Models-Typical Case Studies. **Lecture 28:** Strategies for Transition towards Value-based Life and Profession **Tutorial 14**: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order	**10**

Practice Sessions for UNIT I – Introduction to Value Education PS1
Sharing about Oneself
PS2 Exploring Human Consciousness PS3
Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being PS4
Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self PS6
Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society PS7
Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal
Practice Sessions for UNIT IV – Harmony in the Nature (Existence) PS10
Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence
Practice Sessions for UNIT V
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

Course outcomes:

On completion of the course student will be able to:

1. Define the terms like Natural Acceptance, Happiness and Prosperity (L1, L2).
2. Identify one's self, and one's surroundings (family, society nature) (L1, L2)
3. Apply what they have learnt to their own self in different day-to-day settings in real life (L3).
4. Relate human values with human relationship and human society. (L4).
5. Justify the need for universal human values and harmonious existence (L5).
6. Develop as socially and ecologically responsible engineers (L3, L6).

Textbook and Teachers Manual

1. The Textbook 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
2. The Teacher's Manual R R Gaur, R Asthana, G P Bagaria,Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 978-93-87034-53-

Reference Books:

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004. The Story of Stuff (Book).
3. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi Small is Beautiful - E. F Schumacher.
4. Slow is Beautiful - Cecile Andrews
5. Economy of Permanence - J C Kumarappa
6. Bharat Mein Angreji Raj – PanditSunderlal
7. Rediscovering India - by Dharampal

ELECTROMAGNETIC FIELD THEORY III SEMESTER			
Subject Code	**23EEEET3030**	**IA-Marks**	**30**
Number of Lecture Hours/Week	**3L**	**Exam-Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam-Hours**	**03**
Credits -03			

Course-Objectives:

This course will enable student to:

1. To study the production of electric field and potentials due to different configurations of static charges.
2. To study the properties of conductors and dielectrics, calculate the capacitance of different configurations. Understand the concept of conduction and convection current densities.
3. To study the magnetic fields produced by currents in different configurations, application of Ampere's law and the Maxwell's second and third equations.
4. To study the magnetic force and torque through Lorentz force equation in magnetic field environment like conductors and other current loops.
5. To develop the concept of self and mutual inductances and the energy stored.
6. To study time varying and Maxwell's equations in different forms and Maxwell's fourth equation for the induced EMF.

Unit-I	**Hours**
Vector Analysis: **Vector Algebra:** Scalars and Vectors, Unit vector, Vector addition and subtraction, Position and distance vectors, Vector multiplication, Components of a vector. **Coordinate Systems:** Rectangular, Cylindrical and Spherical coordinate systems. **Vector Calculus:** Differential length, Area and Volume. Del operator, Gradient of a scalar Divergence of a vector and Divergence theorem (definition only). Curl of a vector and Stoke's theorem (definition only), Laplacian of a scalar **Electrostatics:** Coulomb's law and Electric field intensity (EFI) - EFI due to Continuous charge distributions (line and surface charge), Electric flux density, Gauss's law (Maxwell's first equation, $\nabla.\vec{D} = \rho_v$), Applications of Gauss's law, Electric Potential, Work done in moving a point charge in an electrostatic field (second Maxwell's equation for static electric fields, $\nabla \times \vec{E} = 0$), Potential gradient, Laplace's and Poison's equations	**10**
Unit-II	
Conductors – Dielectrics and Capacitance: Behavior of conductor in Electric field, Electric dipole and dipole moment – Potential and EFI due to an electric dipole, Torque on an Electric dipole placed in an electric field, Current density-conduction and convection current densities, Ohm's law in point form, Behavior of conductors in an electric field, Polarization, dielectric constant and strength, Continuity equation and relaxation time, Boundary conditions between conductor to dielectric, dielectric to dielectric and conductor to free space, Capacitance of parallel plate, coaxial and spherical capacitors, Energy stored and density in a static electric field	**10**

Unit-III	
Magneto statics, Ampere's Law and Force in magnetic fields: Biot-Savart's law and its applications viz. Straight current carrying filament, circular, square, rectangle and solenoid current carrying wire – Magnetic flux density and Maxwell's second Equation ($\nabla.\vec{B} = 0$), Ampere's circuital law and its applications viz. MFI due to an infinite sheet, long filament, solenoid, toroidal current carrying conductor, point form of Ampere's circuital law, Maxwell's third equation ($\nabla \times \vec{H} = \vec{J}$). Magnetic force, moving charges in a magnetic field – Lorentz force equation, force on a current element in a magnetic field, force on a straight and a long current carrying conductor in a magnetic field, force between two straight long and parallel current carrying conductors, Magnetic dipole, Magnetic torque, and moment	**10**
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	**07**
Unit-V	
Time Varying Fields: Faraday's laws of electromagnetic induction, Maxwell's fourth equation $\nabla \times \vec{E} = -\frac{dB}{dt}$ 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	**08**

Course outcomes:

On completion of the course student will be able to:

1. Compute electric fields and potentials using Gauss law/ solve Laplace's or Poisson's equations for various electric charge distributions
2. Analyze the behavior of conductors in electric fields, electric diploe and the capacitance and energy stored in dielectrics
3. Calculate the magnetic field intensity due to current carrying conductor and understanding the application of Ampere's law, Maxwell's second and third law
4. Estimate self and mutual inductances and the energy stored in the magnetic field.
5. Understand the concepts of Faraday's laws, Displacement current, Poynting theorem and Poynting vector.

Text Books:

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

ELECTRICAL CIRCUIT ANALYSIS-II SEMESTER-III			
Subject Code	**23EEEET3040**	**IA-Marks**	**30**
Number of Lecture Hours/Week	**3L**	**Exam-Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam-Hours**	**03**
Credits-03			

Course-Objectives:

This course will enable student to:

1. To understand three phase circuits
2. To analyse transients in electrical systems
3. To evaluate network parameters of given electrical network
4. To apply Fourier analysis to electrical systems
5. To understand the behavior of filters

Unit-I	**Hours**
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.	**09**
Unit-II	
Laplace transforms: Definition and Laplace transforms of standard functions– Shifting theorem– Transforms of derivatives and integrals, Inverse Laplace transforms and applications. **Transient Analysis:** Transient response of R-L, R-C and R-L-C circuits (Series and parallel combinations) for D.C. and sinusoidal excitations – Initial conditions - Solution using differential equation approach and Laplace transform approach.	**09**
Unit-III	
Network Parameters: 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.	**09**
Unit-IV	
Analysis of Electric Circuits with Periodic Excitation: Fourier series and evaluation of Fourier coefficients, Trigonometric and complex Fourier series for periodic waveforms, Application to Electrical Systems – Effective value and average value of non-sinusoidal periodic waveforms, power	**09**

factor, effect of harmonics	
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.	**09**

Course outcomes:

On completion of the course student will be able to:

1. Analyse the balanced and unbalanced 3 phase circuits for power calculations.
2. Analyse the transient behaviour of electrical networks in different domains.
3. Estimate various Network parameters.
4. Apply the concept of Fourier series to electrical systems.
5. Analyse the filter circuits for electrical circuits.

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

ReferenceBooks:

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

DC MACHINES & TRANSFORMERS SEMESTER-III			
Subject Code	**23EEEET3050**	**IA-Marks**	**30**
Number of Lecture Hours/Week	**3L**	**Exam-Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam-Hours**	**03**
Credits -03			

Course-Objectives:

This course will enable student to:

1. Understand the characteristics and applications of DC Machines.
2. Develop problem solving Machines. skills about the starting, speed control and testing of DC Machines.
3. Understand the concepts equivalent circuit of efficiency and regulation of a transformer by obtaining
4. Analyze the performance of single-phase transformers and to understand the connection diagrams of three-phase transformers.

Unit-I	**Hours**
DC Generators: Construction and principle of operation of DC machines – EMF equation for generator – Excitation techniques – characteristics of DC generators –applications of DC Generators, Back-emf and torque equations of DC motor – Armature reaction and commutation.	**07**
Unit-II	
Starting, Speed Control and Testing of DC Machines: Characteristics of DC motors – losses and efficiency – applications of DC motors. Necessity of a starter-3-point and 4-point starters – speed control by armature voltage and field current control – testing of DC machines – brake test, Swinburne's test – Hopkinson's test–Field Test..	**08**
Unit-III	
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 – effect of variation of frequency and supply voltage on losses – all day efficiency	**11**
Unit-IV	
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 – equivalent circuit – comparison with two winding transformers.	**11**

Unit-V	
Three-Phase Transformers: Polyphase connections- Y/Y, Y/Δ, Δ/Y, Δ/Δ, open Δ and Vector groups – third harmonics in phase voltages– Parallel operation–three winding transformers-transients in switching –off load and on load tap changers–Scott connection.	**08**
Course outcomes: On completion of the course student will be able to: **1.** Understand the process of voltage build-up in DC generators and characteristics. **2.** Understand the process of torque production, starting and speed control of DC motors and illustrate their characteristics. **3.** Obtain the equivalent circuit of single-phase transformers. **4.** Determine efficiency & regulation of single phase transformers. **5.** Analyze various configurations of three-phase transformers.	
Text Books: **1.** Electrical Machinery by Dr. P S Bimbhra, 7th edition, Khanna Publishers, New Delhi, **2.** Performance and analysis of AC machines by M.G. Say, CBS,	
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 education 2011.McGraw Hill **3.** Generalized Theory of Electrical Machines by Dr. P S Bimbhra, 7th Edition,Khanna Publishers,. **4.** Theory & Performance of Electrical Machines by J.B.Gupta, Sons, **5.** Electric Machinery by Fitzgerald, A.E.,Kingsley, Jr.,C.,& Umans, S. D, 7th edition, McGraw-Hill Education,	

ELECTRICAL CIRCUIT ANALYSIS-II & SIMULATION LAB SEMESTER-III			
Subject Code	**21EEEET3060**	**IA-Marks**	**30**
Number of Practical Hours/Week	**3P**	**Exam-Marks**	**70**
Total Number of Practical Hours	**45**	**Exam-Hours**	**03**
Credits-1.5			

Course-Objectives:

This course will enable student to:

1. To measure three phase Active and Reactive power
2. To analyse transient behavior of circuits
3. To determine 2-port network parameters
4. To analyse electrical circuits using simulation tools

List of Experiments

Any 10 of the following experiments are to be conducted:

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

Course outcomes:

On completion of the course student will be able to:

1. Understand the power calculations in three phase circuits.
2. Evaluate the time response of given network.
3. Evaluate two port network parameters.
4. Simulate and analyse electrical circuits using suitable software.

DC MACHINES & TRANSFORMERS LAB SEMESTER-III			
Subject Code	23EEEEL3070	**IA-Marks**	**30**
Number of Lecture Hours/Week	**3L**	**Exam-Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam-Hours**	**03**
Credits -1.5			

Course-Objectives:

This course will enable student to:

1. To conduct the experiment and plot the characteristics and applications of DC machines.

2. To perform the starting, speed control and testing methods of DC Machines.

3. To determine/Predetermine efficiency and regulation of the transformer through equivalent circuit.

Any 10 of the following experiments are to be conducted:

1. Speed control of DC shunt motor by Field Current and Armature Voltage Control.
2. Brake test on DC shunt motor- Determination of performance curves.
3. Swinburne's test - Predetermination of efficiencies as DC Generator and Motor.
4. Hopkinson's 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.

Course outcomes:

On completion of the course student will be able to:

1. Demonstrate starting and speed control methods of DC Machines.
2. Apply theoretical concepts in analysing the performance characteristics of DC Machines.
3. Determine the performance characteristics of DC machines using different testing methods.
4. Determine the performance parameters of single-phase transformer.

Online Learning Resources:

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

DATA STRUCTURES LAB SEMESTER-III			
Subject Code	**23SOCTI3080**	**IA-Marks**	**30**
Number of Lecture Hours/Week	**1L+2P**	**Exam-Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam-Hours**	**03**
Credits -2			

Course-Objectives:

This course will enable student to:

1. To provide the knowledge of basic data structures and their implementations.
2. To understand importance of data structures in context of writing efficient programs.
3. To develop skills to apply appropriate data structures in problem solving.

Unit-I	**Hours**
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.	**09**
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.	**08**
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.	**10**

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.	**08**
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.	**10**

Course outcomes:

On completion of the course student will be able to:

1. Identify the role of data structures in organizing and accessing data.
2. Design, implement, and apply linked lists for dynamic data storage.
3. Develop applications using stacks and queues.
4. Design and implement algorithms for operations on binary trees and binary search.
5. Devise novel solutions to small scale programming challenges involving data structures such as stacks, queues, Trees.

Text Books:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson- Freed, Silicon Press,

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.

ENVIRONMENTAL SCIENCE SEMESTER –III			
Subject Code	**23CMCEN3090**	**Internal Marks**	**30**
Number of Lecture Hours/Week	**02**	**External Marks**	**70**
Total Number of Lecture Hours	**30**	**Exam Hours**	**03**
Credits – 0			

Course Objectives:

This course will enable:

1. To make the students to get awareness on environment
2. To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
3. To save earth from the inventions by the engineers.
4. To understand pollution control equipments
5. To make the students to get awareness on social issues.

Unit -I	**Hours**
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 – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, – Energy resources	**08**
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. Grass land ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) **Biodiversity and Its Conservation**: Introduction and 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 wild life, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	**08**

Unit – III	
Environmental Pollution: Definition, Cause, effects and control measures of: a. Air Pollution. b. Water pollution c. Soil pollution d. Noise pollution e. Thermal pollution f. 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	**08**
Unit –IV	
Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion– Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.	**08**
Unit – 5	
Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programs. – 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.	**08**
Course outcomes: Upon successful completion of the course student will be able to 1. Grasp multi-disciplinary nature of environmental studies and variousrenewable and non-renewable resources. 2. Understand flow and bio-geo- chemical cycles and ecologicalpyramids. 3. Understand various causes of pollution and solid waste managementand related preventive measures. 4. Understand the rainwater harvesting, watershed management, ozonelayer depletion and waste land reclamation. 5. Illustrate the causes of population explosion, value education and welfare programmes.	

Text Books:

1. ErachBharucha, TextbookofEnvironmental StudiesforUnder graduate Courses, Universities Press (India) Private Limited, 2019.
2. Palani swamy, Environmental Studies, 2/e, Pearson education, 2014.
3. S. Azeem Unnisa, Environmental Studies, Academic Publishing Company, 2021.
4. K. Raghavan Nambiar, "Text book of Environmental Studies for under graduate Courses as per UGC model syllabus", SciTech Publications (India), Pvt. Ltd, 2010.

Reference Books:

1. Deeksha DaveandE.Sai Baba Reddy, Text book of Environmental Science, 2/e, Cengage Publications, 2012.
2. M. Anji Reddy, "Text book of Environmental Sciences and Technology", B S Publication, 2014.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.
4. J.Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.
5. G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018.

Online Resources

1. https://onlinecourses.nptel.ac.in/noc23_hs155/preview
2. https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmentalscience-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2-d84c-4773-83881b2f8f6a75f2&webview=false&campaign=AP%C2%AE+Environmental+Science++Part+3%3A+Pollution+and+Resources&source=edX&product_category=course&placement_url=https%3A%2F%2Fwww.edx.org%2Flearn%2Fenvironmental-science
3. http://ecoursesonline.iasri.res.in/Courses/Environmental%20ScienceI/Data%20Files/pdf/lec07.pdf
4. https://www.youtube.com/watch?v=5QxxaVfgQ3k

Course Structure for II B. Tech II Semester Under the Regulations of SITE-23							
IV SEMESTER							
S. No	Course Category	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	MS	23EEMST4010	Managerial Economics & Financial Analysis	2	0	0	2
2	ES/BS	23EEEET4020	Analog Circuits	3	0	0	3
3	PC	23EEEET4030	Power Systems-I	3	0	0	3
4	PC	23EEEET4040	Induction and Synchronous Machines	3	0	0	3
5	PC	23EEEET4050	Control Systems	3	0	0	3
6	PC	23EEEEL4060	Induction and Synchronous Machines Lab	0	0	3	1.5
7	PC	23EEEEL4070	Control Systems Lab	0	0	3	1.5
8	SOC	23SOCTI4080	Python Programming Lab	0	1	2	2
9	ES	23EEMS4090	Design Thinking & Innovation	1	0	2	2
Total				**15**	**1**	**10**	**21**

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS SEMESTER-IV			
Subject Code	**23MSEET4010**	**IA Marks**	**30**
Number of Lecture Hours/Week	**2**	**Exam Marks**	**70**
Total Number of Lecture Hours	**32**	**Exam Hours**	**03**
Credits - 02			

Course objectives:

1. To inculcate the basic knowledge of microeconomics and financial accounting
2. To make the students learn how demand is estimated for different products, input- output relationship for optimizing production and cost
3. To Know the Various types of market structure and pricing methods and strategy
4. To provide fundamental skills on accounting and to explain the process of preparing financial statements.
5. To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.

Unit -I	**Hours**
Managerial Economics: Introduction – Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.	**06**
UNIT - II	
Production and Cost Analysis: Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and long run Production Function- Isoquants and Is costs, Cost & Break-Even Analysis - Cost concepts and Cost behaviour- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).	**06**
UNIT - III	
Business Organizations and Markets: Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition– Oligopoly-Price-Output Determination - Pricing Methods and Strategies	**06**
UNIT - IV	
Capital Budgeting: Introduction – Nature, meaning, significance. Types	**07**

of Working Capital, Components, Sources of Short-term and Long-term Capital. Estimating Working capital requirements. Capital Budgeting– Features, Proposals, Methods and Evaluation. Projects – Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)	
UNIT - V	
Financial Accounting and Analysis: Introduction – Concepts and Conventions- Double-Entry Bookkeeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.	**07**
Course outcomes: **1.** Define the concepts related to Managerial Economics, financial accounting and management(L2) **2.** Understand the fundamentals of Economics viz., Demand, Production, cost, revenue and markets (L2) **3.** Apply the Concept of Production cost and revenues for effective Business decision (L3) **4.** Analyze how to invest their capital and maximize returns (L4) **5.** Develop the accounting statements and evaluate the financial performance of business entity (L5) **6.** Evaluate the capital budgeting techniques. (L5)	
Textbooks: **1.** Varshney & Maheswari: Managerial Economics, Sultan Chand. **2.** Aryasri: Business Economics and Financial Analysis, 4/e, MGH.	
Reference Books: **1.** Ahuja Hl Managerial economics SChand. **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	

ANALOG CIRCUITS SEMESTER-IV			
Subject Code	**23EEEET4020**	**IA-Marks**	**30**
Number of Lecture Hours/Week	**3L**	**Exam-Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam-Hours**	**03**
Credits -03			

Course-Objectives:

This course will enable student to:

1. To acquire the basic knowledge on clippers, clampers & biasing circuits.
2. To determine the h-parameters of a transistor circuit & understand the concepts of Feedback amplifiers.
3. To know the operation of oscillators and operational amplifier.
4. To understand the applications of operational amplifier.
5. To acquire the knowledge on IC 555 timer and their applications.
6. To know the operation of Analog to Digital Converters and Digital to Analog Converters.

Unit-I	**Hours**
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 V_{BE} and β for the Self-Bias Circuit, Bias Compensation, Thermal Runaway, Thermal Stability.	**8**
Unit-II	
Small Signals Modelling of BJT: Analysis of a Transistor Amplifier Circuit using h- parameters, Simplified CE Hybrid Model, Analysis of CE, CC, CB Configuration using Approximate 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.	**10**
Unit-III	
Oscillator Circuits: Barkhausen Criterion of oscillation, Oscillator operation, R-C phase shift oscillator, Wien bridge Oscillator, Crystal 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.	**10**
Unit-IV	
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.	**10**

Comparators and Waveform Generators: Introduction, Comparator, Square Wave Generator, Monostable Multivibrator, Triangular Wave Generator, Sine Wave Generators.	
Unit-V	
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, inverted R-2R DAC, A-D Converters – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.	**10**

Course outcomes:

On completion of the course student will be able to:

1. Analyze diode clipping and clamping circuits. Understand different types of biasing circuits of a transistor.
2. Use small signal modeling for transistor circuit analysis and illustrate the operation of feedback amplifiers.
3. Understand operation of oscillators ,operational amplifier & their applications.
4. Use 555 timers in multi-vibrators, Schmitt Trigger and PLL applications.
5. Describe the operation of different ADC's and DAC's.

Text Books:

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

Reference Books:

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

POWER SYSTEMS-I SEMESTER-IV			
Subject Code	**23EEEE4030**	**IA-Marks**	**30**
Number of Lecture Hours/Week	**3L**	**Exam-Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam-Hours**	**03**
Credits -03			

Course-Objectives:

This course will enable student to:

1. To study principle of operation of different components of a hydro and thermal power stations.
2. To study principle of operation of different components of a nuclear power stations.
3. To study constructional and operation of different components of an Air and Gas Insulated substations.
4. To study different types of cables and distribution systems.
5. To study different types of load curves and tariffs applicable to consumers.

Unit-I	**Hours**
Hydroelectric Power Stations: Selection of site, general layout of a hydroelectric power plant with brief description of major components and principle of operation. **Thermal Power Stations:** Selection of site, general layout of a thermal power plant. Brief description of components: boilers, super heaters, economizers and electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.	**10**
Unit-II	
Nuclear Power Stations: Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction. **Nuclear reactor components:** Moderators, control rods, reflectors and coolants, types of nuclear reactors and brief description of PWR, BWR and FBR. **Radiation:** Radiation hazards and shielding, nuclear waste disposal.	**10**
Unit-III	
Substations: **Air Insulated Substations** – indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment. Bus bar arrangements in the sub- stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams. **Gas Insulated Substations (GIS)** – advantages of gas insulated substations, constructional aspects of GIS, comparison of air insulated substations and gas insulated substations.	**10**

Unit-IV	
Underground Cables: Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable. Capacitance of single and 3-Core belted Cables. Grading of cables: capacitance grading and inter-sheath grading. **Distribution Systems:** Classification of distribution systems, A.C distribution, overhead versus underground system, connection schemes of distribution system, requirements of a distribution system, and design considerations in distribution system.	**10**
Unit-V	
Economic Aspects & Tariff: **Economic Aspects:** load curve, load duration and integrated load duration curves, **discussion on economic aspects:** connected load, maximum demand, and demand factor, load factor, diversity factor, plant capacity factor and plant use factor, base and peak load plants. **Tariff Methods:** Costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, **Tariff methods:** simple rate, flat rate, block rate, two-part, three–part, and power factor tariff methods.	**10**

Course outcomes:

On completion of the course student will be able to:

1. Understand the different types of components, operation of hydro and thermal power plants.
2. Understand the different types of components, operation of a nuclear power plants.
3. Describe the different components of air and gas insulated substations.
4. Discuss the construction of single core and three core cables and describe distribution system configurations.
5. Analyze different economic factors of power generation and tariffs.

Text Books:

3. S. N. Singh, Electric Power Generation, Transmission and Distribution, PHI Learning Pvt Ltd, New Delhi, 2nd Edition.
4. J.B.Gupta, Transmission and Distribution of Electrical Power, S.K.Kataria and sons,10th Edition.

Reference Books:

1. I.J. Nagarath & D.P. Kothari, Power System Engineering, McGraw-Hill Education, 3rd Edition.
2. C.L.Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International Publishers, 6th edition.
3. V. K. Mehta and Rohit Mehta, Principles of Power System, S. Chand, 4th edition.
4. Turan Gonen, Electric Power Distribution System Engineering, McGraw-Hill.
5. Handbook of switchgear, BHEL, McGraw-Hill Education.

Online Learning Resources:

1. https://nptel.ac.in/courses/108102047

INDUCTION AND SYNCHRONOUS MACHINES SEMESTER-IV			
Subject Code	**23EEEET4040**	**IA-Marks**	**30**
Number of Lecture Hours/Week	**3L**	**Exam-Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam-Hours**	**03**
Credits -03			

Course-Objectives:

This course will enable student to:

1. Characteristics, starting and testing methods of Induction Motor
2. Torque production and performance of Induction Motor.
3. In determining the performance parameters of Induction Motor.
4. Working of synchronous machines

Unit-I	**Hours**
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– rotor power input, rotor copper loss and mechanical power developed and their inter-relationship –equivalent circuit – phasor diagram.	**08**
Unit-II	
Performance of 3-Phase induction motors: Torque equation – expressions for maximum torque and starting torque – torque-slip characteristics – double cage and deep bar rotors –No load, Brake test and Blocked rotor tests – circle diagram for predetermination of performance- methods of starting –starting current and torque calculations -speed control of induction motor with V/f control method, rotor resistance control and rotor emf injection technique – crawling and cogging-induction generator operation.	**07**
Unit-III	
Single phase induction motors Constructional features – double revolving field theory, Cross field theory – equivalent circuit- starting methods: capacitor start capacitor run, capacitor start induction run, split phase & shaded pole, AC series motor.	**06**
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-methods of synchronization-slip test-parallel operation.	**12**
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	**12**

–hunting and its suppression – methods of starting.	

Course outcomes:

On completion of the course student will be able to:

1. Explain the construction and operation of three-phase induction motor.
2. Analyse the performance of three-phase induction motor.
3. Describe the working of single-phase induction motors.
4. Analyse the performance of Synchronous generators.
5. Analyse the performance of Synchronous motors.

Text Books:

1. Electrical Machinery, Dr. P.S. Bhimbra, Khanna Publishing, First Edition.
2. Performance and analysis of AC machines by M.G. Say, CBS.

Reference Books:

1. Electrical machines, D.P. Kothari and I.J. Nagrath, McGraw Hill Education, Fifth Edition.
2. Theory & Performance of Electrical Machines by J.B.Gupta, S.K.Kataria& Sons.
3. Electric Machinery, A.E.Fitzgerald, Charles kingsley, Stephen D.Umans, McGraw-Hill, Seventh edition.

CONTROL SYSTEMS SEMESTER-IV			
Subject Code	**23EEEET4050**	**IA-Marks**	**30**
Number of Lecture Hours/Week	**3L**	**Exam-Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam-Hours**	**03**
Credits-03			

Course-Objectives:

This course will enable student to:

1. To obtain the mathematical models of physical systems and derive transfer function.
2. To determine the time response of systems and analyze system stability.
3. To analyze system stability using frequency response methods.
4. To design compensators using Bode diagrams.
5. To obtain the mathematical models of physical systems using state space approach and determine the response.

Unit-I:	**Hours**
Mathematical Modeling of Control Systems Classification of control systems - open loop and closed loop control systems and their differences-Feedbackcharacteristics-transferfunctionoflinearsystem, differential equations of electrical networks-translational and rotational mechanical systems-transfer function of Armature voltage controlled DC servomotor-block diagram algebra– representation by signal flow graph–reduction using Mason's gain formula	**10**
Unit-II	
Time Response Analysis Standard test signals–time response of first and second order systems–time domain Specifications - steady state errors and error constants - effects of proportional (P) - proportional integral (PI) - proportional derivative (PD) proportional integral derivative (PID) systems. **Stability and Root Locus Technique:** The concept of stability – Routh's stability criterion – limitations of Routh's stability, root locus concept – construction of root loci (simple problems) - Effect of addition of Poles and Zeros to the transfer function.	**10**
Unit-III	
Frequency Response Analysis: Introduction to frequency domain specifications – Bode diagrams – transfer function from the Bode diagram –Polar plots, Nyquist stability criterion- stability analysis using Bode plots (phase margin and gain margin).	**9**
Unit-IV	
Classical Control Design Techniques: Lag, lead, lag-lead compensators - physical realization - design of compensators using Bode plots.	**8**

Unit-V	
State Space Analysis of LTI Systems: Concepts of state - state variables and state model - state space representation of transfer function: Controllable Canonical Form - Observable Canonical Form - Diagonal Canonical Form - diagonalization using linear transformation - solving the time invariant state equations State Transition Matrix and its properties- concepts of controllability and observability.	**8**

Course outcomes:

On completion of the course student will be able to:

1. Derive the transfer function of physical systems and determine overall transfer function using block diagram algebra and signal flow graphs.
2. Obtain the time response of first and specifications of second order systems and determine error Constants. Analyze the absolute and relative stability of LTI systems using Routh's stability Criterion and root locus method.
3. Analyze the stability of LTI systems using frequency response methods.
4. Design Lag, Lead, Lag-Lead compensators to improve system performance using Bode Diagrams.
5. Apply state space analysis concepts to represent physical systems as state models, derive Transfer function and determine the response. Understand the concepts of controllability and observability.

Text Books:

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India.
2. Automatic control systems by Benjamin C. Kuo, Prentice Hall of India, 2ndEdition.

Reference Books:

1. Control Systems principles and design by M.Gopal, Tata Mc Graw Hill education Pvt Ltd., 4th Edition.
2. Control Systems Engineering by Norman S.Nise, Wiley Publications, 7thedition.
3. Control Systems by Manik Dhanesh N,Cengage publications.
4. Control Systems Engineering by I.J.NagarathandM.Gopal,NewagePublications, 5th Edition.
5. Control Systems Engineering by S.Palani,TataMcGrawHill Publications.

INDUCTION AND SYNCHRONOUS MACHINES LAB SEMESTER-IV			
Subject Code	**23EEEEL4060**	**IA-Marks**	**30**
Number of Lecture Hours/Week	**3P**	**Exam-Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam-Hours**	**03**
Credits -1.5			

Course-Objectives:

This course will enable student to:

1. To apply the concepts of speed control methods in 3-phase Induction Motor.
2. To experimentally develop circle diagram and obtain equivalent circuit to analyse the performance of 3-phase induction motor
3. To apply the concepts of power factor improvement on single phase Induction Motor
4. To perform various testing methods on alternators for experimentally predetermine the regulation

Any 10 experiments of the following are required to be conducted

1. Brake test on three phase Induction Motor.
2. Circle diagram of three phase induction motor.
3. Speed control of three phase induction motor by V/f method.
4. Equivalent circuit of single-phase induction motor.
5. Power factor improvement of single-phase induction motor by using capacitors.
6. Load test on single phase induction motor.
7. Regulation of a three -phase alternator by synchronous impedance &MMF methods.
8. Regulation of three-phase alternator by Potier triangle method.
9. V and Inverted V curves of a three-phase synchronous motor.
10. Determination of X_d, X_q& Regulation of a salient pole synchronous generator.
11. Determination of efficiency of three phase alternator by loading with three phase induction motor.
12. Parallel operation of three-phase alternator under no-load and load conditions.
13. Determination of efficiency of a single-phase AC series Motor by conducting Brake test.

Course outcomes:

On completion of the course student will be able to:

1. Aanalyse the speed control methods on 3-phase Induction Motor.
2. Evaluate the performance of 3-phase Induction Motor by obtaining the locus diagram and equivalent circuit of 3-phase Induction Motor
3. Adapt the power factor improvement methods for single phase Induction Motor CO4: Pre-determine the regulation of 3-phase alternator
4. Determine the synchronous machine reactance of 3-phase alternator

Online Learning Resources:

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

CONTROL SYSTEMS LAB SEMESTER-IV			
Subject Code	**23EEEEL4070**	**IA-Marks**	**30**
Number of Lecture Hours/Week	**3P**	**Exam-Marks**	**70**
Total Number of Lecture Hours		**Exam-Hours**	**03**
Credits-1.5			

Course-Objectives:

This course will enable student to:

1. To impart hands on experience to understand the performance of basic control system components Such as magnetic amplifiers, D.C. servo motors, A.C. Servo motors and Synchros.
2. To understand Time and frequency response of the control system with and without controllers and Compensators.
3. To know the different logic gates and Boolean expressions using PLC.
4. To understand the applications of controllers and compensators.
5. To apply the modern tools like MATLAB

List of Experiments

Any 10 of the following experiments are to be conducted:

1. Analysis of Second order system in time domain.
2. Effect of P, PD, PI, PID Controller on a second order systems.
3. Design of Lag and lead compensation–Magnitude and phase plot.
4. Transfer function of DC motor.
5. Root locus, Bode Plot and Nyquist Plot for the transfer function of systems up to 5^{th} order using MATLAB.
6. Kalman's test of Controllability and Observability using MATLAB.
7. Temperature controller using PID.
8. Characteristics of AC servo motor.
9. Characteristics of DC servo motor.
10. Characteristics of Synchros.
11. Study and verify the truth table of logic gates and simple Boolean expressions using PLC.
12. Characteristics of magnetic amplifier.

Course outcomes:

On completion of the course student will be able to:

1. Analyze the performance of the Magnetic amplifier, DC and A.C servomotors and Synchro's.
2. Design of PID controllers and compensators.
3. Evaluate temperature control of an oven using PID controller
4. Determine the transfer function of D.C Motor and examine the truth table of logic gates using PLC.
5. Judge the stability in time and frequency domain and Kalman's test for controllability and Observability.

PYTHON PROGRAMMING LAB SEMESTER-III			
Subject Code	**23SOCTI4080**	**IA-Marks**	**30**
Number of Lecture Hours/Week	**1T+2P**	**Exam-Marks**	**70**
Total Number of Lecture Hours	**45**	**Exam-Hours**	**03**
Credits -02			

Course-Objectives:

This course will enable student to:

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

Unit I	**Hours**
History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook. Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language. Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement Sample Experiments: 1. Write a program to find the largest element among three Numbers. 2. Write a Program to display all prime numbers within an interval 3. Write a program to swap two numbers without using a temporary variable. 4. Demonstrate the following Operators in Python with suitable examples. i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators 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.	**08**
Unit II	
Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments. Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings. Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement. **Sample Experiments:**	**07**

1. Write a program to define a function with multiple return values. **2.** Write a program to define a function using default arguments. **3.** Write a program to find the length of the string without using any library functions. **4.** Write a program to check if the substring is present in a given string or not. **5.** Write a program to perform the given operations on a list: i. addition ii. insertion iii. slicing **6.** Write a program to perform any 5 built-in functions by taking any list.	
Unit III	
Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement. Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset. **Sample Experiments:** **1.** Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples. **2.** Write a program to count the number of vowels in a string (No control flow allowed). **3.** Write a program to check if a given key exists in a dictionary or not. **4.** Write a program to add a new key-value pair to an existing dictionary. **5.** Write a program to sum all the items in a given dictionary.	**10**
Unit IV	
Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules. Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism. **Sample Experiments:** **1.** 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. **2.** Python program to print each line of a file in reverse order. **3.** Python program to compute the number of characters, words and lines in a file. **4.** Write a program to create, display, append, insert and reverse the order of the items in the array. **5.** Write a program to add, transpose and multiply two matrices. **6.** 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.	**08**
Unit V	
Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.	**07**

Sample Experiments:

1. Python program to check whether a JSON string contains complex object or not.
2. Python Program to demonstrate NumPy arrays creation using array () function.
3. Python program to demonstrate use of ndim, shape, size, dtype.
4. Python program to demonstrate basic slicing, integer and Boolean indexing.
5. Python program to find min, max, sum, cumulative sum of array
6. 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
7. 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

Online Learning Resources/Virtual Labs:

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

Reference Books:

1. Gowri shankar 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.

DESIGN THINKING & INNOVATION SEMESTER-IV			
Subject Code	**23EEEEL4090**	**IA-Marks**	**30**
Number of Lecture Hours/Week	**1L+2P**	**Exam-Marks**	**70**
Total Number of Lecture Hours	**36**	**Exam-Hours**	**03**
Credits -02			

Course-Objectives:

This course will enable student to:

1. Bring awareness on innovative design and new product development.
2. Explain the basics of design thinking.
3. Familiarize the role of reverse engineering in product development.
4. Train how to identify the needs of society and convert into demand.
5. Introduce product planning and product development process.

Unit 1	**Hours**
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.	**07**
Unit 2	
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.	**08**
Unit 3	
Innovation Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.	**10**
Unit 4	
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.	**10**
Unit 5	
Design Thinking in Business Processes	**10**

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes. **Activity:** How to market our own product, about maintenance, Reliability and plan for startup.	
Course outcomes: On completion of the course student will be able to: **1.** Define the concepts related to design thinking. **2.** Explain the fundamentals of Design Thinking and innovation. **3.** Apply the design thinking techniques for solving problems in various sectors. **4.** Analyse to work in a multidisciplinary environment. **5.** Evaluate the value of creativity.	
Text Books: **1.** Tim Brown, Change by design, 1/e, Harper Bollins, 2009. **2.** Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.	
Reference Books: **1.** David Lee, Design Thinking in the Classroom, Ulysses press, 2018. **2.** Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018. **3.** Chesbrough.H, The era of open innovation, 2003.	
Online Learning Resources: **1.** https://nptel.ac.in/courses/110/106/110106124/ **2.** https://nptel.ac.in/courses/109/104/109104109/ **3.** https://swayam.gov.in/nd1_noc19_mg60/preview **4.** https://onlinecourses.nptel.ac.in/noc22_de16/preview	