Nalla Narasimha Reddy Group of Institutions

NNRG
Integrated Campus

NALLA NARASIMHA REDDY

Education Society's Group of Institutions - Integrated Campus

(Approved by AICTE & PCI, New Delhi & Affiliated to JNTUH, Accredited by NAAC with A+ Grade)

Chowdariguda (V), Korremula 'X' Roads, Ghatkesar (M), Medchal-Malkajgiri Dist., Hyderabad, T.S. - 500 088.

(UGC AUTONOMOUS INSTITUTION)

Accredited by A+ NAAC

NBA CSE ECE NATIONAL BOARD OF ACCREDITATION

Student Handbook

Name :

Branch : Section :

Roll No. :

B. Tech 1st Year (2025-26)

www.nnrg.edu.in

Name	
Roll No.	
Branch & Section	
APAAR ID	

CLASS TIME TABLE

DAY/TIME	09:15 - 10:10	10:10 - 11:00	11:00 - 11:50	11:50 - 12:30	12:30 - 01:20	01:20 - 02:10	02:10 - 02:20	02:20 - 03:10	03:10 - 04:00
Monday				LUNCH BREAK			BREAK		
Tuesday									
Wednesday									
Thursday									
Friday									
Saturday									

MID EXAMINATIONS TIME TABLE

Timing: **FN:** 10:00 AM to 12:00 PM; **AN:** 1:30 PM to 3:30 PM

Subject						
MID-I						
MID-II						

Nalla Narasimha Reddy Group of Institutions Integrated Campus

FOUNDER

Secretary	**Shri Nalla Narasimha Reddy**	**Nalla Narasimha Reddy Education Society's Group of Institutions**

KEY FUNCTIONARIES OF NNRG

NAME	DESIGNATION
Dr. C.V. Krishna Reddy	**Director**
Dr. G. Janardhana Raju	**Dean - School of Engineering**
Dr. Ch. Krishna Mohan	**Dean - School of Pharmacy**
Dr. T. Ravindra Reddy	**Dean - School of Management Sciences**

Hallmarks of NNRG
▪ **DISCIPLINE**
▪ **HARD WORK**
▪ **RESPECT AND VALUES**

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SYLLAUBUS, ASSIGNMENTS & PREVIOUS YEAR QUESTION PAPERS

I. ACADEMIC CALENDAR FOR 2025-26

B. Tech I YEAR I & II SEMESTERS

I SEMESTER

S. No	Description	Duration	
		From	To
	Induction Program	**18.08.2025 – 23.08.2025 (1 Week)**	
1	Commencement of I Semester class work	**25.08.2025**	
2	1st Spell of Instructions	**25.08.2025**	**27.09.2025 (5 Weeks)**
3	Dusshera Holidays	**29.09.2025**	**04.10.2025 (1 Week)**
4	Continuation of 1st Spell of Instructions	**06.10.2025**	**01.11.2025 (4 Weeks)**
5	First Mid Term Examinations	**03.11.2025**	**08.11.2025 (1 Week)**
6	Submission of First Mid Term Exam Marks to the Exam Branch on or before	**13.11.2025**	
7	2nd Spell of Instructions	**10.11.2025**	**27.12.2025 (7 Weeks)**
8	Parent Teacher Meeting	**15.11.2025**	
9	Second Mid Term Examinations	**29.12.2025 to 17.01.2026 (3 Weeks)**	
10	Preparation Holidays and Practical Examinations		
11	Submission of Second Mid Term Exam Marks to the Exam Branch on or before	**06.01.2026**	
12	End Semester Examinations	**19.01.2026**	**31.01.2026 (2 Weeks)**

II SEMESTER

S. No	Description	Duration	
		From	To
1	Commencement of II Semester class work	**02.02.2026**	
2	1st Spell of Instructions	**02.02.2026**	**28.03.2026 (8 Weeks)**
3	First Mid Term Examinations	**30.03.2026**	**04.04.2026 (1 Week)**
4	Submission of First Mid Term Exam Marks to the Exam Branch on or before	**07.04.2026**	
5	2nd Spell of Instructions	**06.04.2026**	**08.05.2026 (5 Weeks)**
6	Parent Teacher Meeting	**25.04.2026**	
7	Summer Vacation	**10.05.2026 to 24.05.2026 (2 Weeks)**	
8	3rd Spell of Instructions	**25.05.2026 to 06.06.2026 (2 Weeks)**	
9	Second Mid Term Examinations	**08.06.2026 to 20.06.2026 (2 Weeks)**	
10	Preparation Holidays and Practical Examinations		
11	Submission of Second Mid Term Exam Marks to the Exam Branch on or before	**15.06.2026**	
12	End Semester Examinations	**22.06.2026**	**04.07.2026 (2 Weeks)**

DIRECTOR
DIRECTOR
Nalla Narasimha Reddy Education Society's
Group of Institutions-Integrated Campus,
UGC AUTONOMOUS INSTITUTIONS
Chowdariguda (V), Ghatkesar (M),
Medchal-Malkajgiri (Dist), T.S.

II. ACADEMIC REGULATIONS (R25)

ACADEMIC REGULATIONS R-25 FOR B.TECH. (REGULAR) STUDENTS (Applicable for the students admitted from academic year 2025-2026 onwards)

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

Nalla Narasimha Reddy Education Society's Group of Institutions offers new regulations termed as R-25 regulations for four-year (eight semesters) **Bachelor of Technology** (B.Tech.) degree Programme, under Choice Based Credit System (CBCS) with effect from the academic year **2025-26.**

2.0 Eligibility for Admission

2.1 Admissions to the undergraduate (UG) programme shall be made either on the basis of the merit rank obtained by the qualified students at the entrance test conducted by Telangana Government (EAPCET) or the **University/Institution** or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the government from time to time.

2.2 The medium of instruction for the entire undergraduate programme in Engineering & Technology will be **English** only.

3.0 B.Tech. Programme Structure

3.1 A student after securing admission shall complete the B.Tech. programme in a minimum period of **four** academic years and a maximum period of **eight** academic years starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Tech. course. Each student has to secure a minimum of 160 credits out of 164 credits for successful completion of the undergraduate programme and award of the B.Tech. degree.

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

3.2.1 Semester Scheme

The undergraduate programme is of four academic years and there shall be two semesters in each academic year. There shall be a minimum of 15 weeks of instruction, excluding the mid- term and semester-end exams. Around 15 instruction hours, 30 instruction hours and 45 hours of learning need to be followed per one credit of theory course, practical course and project/field-based learning respectively. In each semester, there shall be 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)' under Choice Based Credit System (CBCS). The curriculum/course structure suggested by AICTE is followed as a reference document.

3.2.2 Credit Courses

All courses offered in each semester are to be registered by the student. Against each course in the course structure, the L: T: P: C (Lecture periods: Tutorial periods: Practical periods:

Credits) pattern has been defined.

- One credit is allocated for one hour per week in a semester for lecture (L) or Tutorial (T) session.
- One credit is allocated for two hours per week in a semester for Laboratory/ Practical (P) session.
- One credit is allocated for three hours per week in a semester for Project/Mini-Project session.

For example, a theory course with three credit weightage requires three hours of classroom instruction per week, totaling approximately 45 hours of instruction over the entire semester.

3.2.3 Subject Course Classification

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

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BS – Basic Sciences	Includes Mathematics, Physics and Chemistry courses
2		ES - Engineering Sciences	Includes Fundamental Engineering Courses
3		HS – Humanities and Social Sciences	Includes courses related to Humanities, Social Sciences and Management
4	Core Courses (CoC)	PC – Professional Core	Includes core courses related to the parent branch of Engineering.
5	Elective Courses (EℓC)	PE – Professional Electives	Includes elective courses related to the parent branch of Engineering.
6		OE – Open Electives	Elective courses which include inter-disciplinary courses or courses in an area outside the parent branch of Engineering.
7	Project Core	Project Work	B.Tech. Project Work
7	Other Core Courses (OCC)	Industry Training/ Internship/ Industry Oriented Mini-project/Skill Development Courses	Industry Training/ Internship/ Industry Oriented Mini- Project/Skill Development Courses
8			
9		Seminar	Seminar based on core contents related to parent branch of Engineering.
10	Skill Development Courses (SDC)	-	Courses designed to help individuals gain, improve, or refine specific skills
11	Value Added Courses (VAC)	-	Courses to build professional values, traditional knowledge and sensitization of societal issues

4.0 Mandatory Induction Programme

An induction program of one week duration for the UG students entering the institution, right at the start shall be implemented. Normal classes commence only after the induction programme is conducted. Following activities could be part of the induction programme: i) Physical Activity, ii) Creative Arts, iii) Imparting Universal Human Values, iv) Literary Activities, v) Lectures by Eminent People, vi) Visits to Local Areas and vii) Familiarization to department as well as entire institute and viii) Making students understand Innovative practices at the college premises etc.

5.0 Course Registration

5.1 A faculty advisor / mentor shall be assigned to a group of around 20 students, who will advise the students about the undergraduate programme, its course structure and curriculum, choices/options of the courses, based on their competence, progress, pre-requisites and interest.

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

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

5.4 A student shall register for all the courses offered in a semester as specified in the course structure.

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

5.6 The Head of the Department / Course Coordinator should review vacant slots in the timetable of each section once in every week or fortnight. The vacant slots in the time-table may be allocated to the subject teachers who could not take classes in proportion to the number of weeks completed from the commencement of the semester.

5.7 Two faculty members may be allocated for the tutorial session of Mathematics-1 course for better interaction/practice and to minimise the failures in the subject.

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

Students have the flexibility to choose from the list of professional electives offered by the Institute or opt to register for the equivalent Massive Open Online Courses (MOOCs) as listed from time to time by the Institution.

5.9 **Open Electives**: Students have to choose three Open Electives (OE-I, II & III) from three baskets of Open Electives given by other than the parent department. However, the student can opt for an Open Elective course offered by his parent department, if the student has not registered and not studied that course so far. Similarly, Open Elective courses being studied should not match with any courses of the forthcoming semesters.

5.10 **Provision for Early Registration of MOOCs:**

For a professional elective in a semester, students are allowed to register for an equivalent MOOCs course listed from time to time by the Institute one semester in advance. For example, a Professional Elective of III Year II Sem shall be allowed to register under MOOCs platform in III year I Sem.

The credits earned in one semester in advance can be submitted in the subsequent semester for the assessment.

The students who have registered in advance in an equivalent MOOCs course and fail to secure any pass grade in the MOOCs course, can register for the regular course offered in the following semester of their course structure.

5.11 **Conversion of Marks Secured in MOOCs into Grades**: Marks secured in the internal and external evaluations of a MOOCs course shall be scaled to 40 and 60 marks respectively. The sum of these two components shall be considered as the total marks out of 100. The corresponding grade shall then be determined as per the marks-to-grades conversion rules specified in Clause 10.3.

5.12 MOOCs are allowed only for professional elective courses and for a few Minors & Honors courses

5.13 **Additional learning resources:**

Students are encouraged to acquire additional course-related knowledge by auditing learning resources from MOOCs platforms for each course offered in their course structure. These additional courses are not meant for earning credits but are intended to enhance knowledge. The institute shall notify such courses from time to time through their portals for the benefit of students. They are categorized into three types: prerequisite, reinforcement, and aspirational. Prerequisite courses help students gain familiarity and provide sufficient background. Reinforcement courses aim to offer different perspectives on learning, while aspirational courses focus on next-level or advanced learning.

6.0 **Rules to offer Elective courses**

6.1 An elective course may be offered to the students, only if a minimum of 25% of class strength opts for it.

6.2 Same elective course for different sections may be offered by different faculty members. The selection of elective course by students will be based on first come first serve and / or CGPA criterion.

6.3 If the number of students registrations are more than the strength of one section, then it is choice of the concerned Department to offer the same course for more than one section based on the resources available in the department.

7.0 Attendance requirements:

7.1 A student shall be eligible to appear for the semester-end examinations, if the student acquires a minimum of 75% of aggregate attendance of all the courses for that semester.

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

7.3 A stipulated fee shall be payable for condoning of shortage of attendance as notified in the respective college websites.

7.4 **Two hours** of attendance for each theory course shall be considered, if the student appears for the mid-term examination of that course.

7.5 Shortage of attendance below 65% in aggregate shall in **no** case be condoned.

7.6 Students whose shortage of attendance is not condoned in any semester, are not eligible to take their semester-end examinations of that semester. They get detained and will not be promoted to the next semester. Their registration for that semester shall stand cancelled, including internal marks. They may seek re-registration for that semester in the next academic year.

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

8.0 Criteria for Earning of Credits in a Course

8.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if the student secures not less than 35% (21 marks out of 60 marks) in the semester end examinations (SEE), and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing **'C'** grade or above in that course.

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

8.3 A student eligible to appear in the semester-end examination for any course, is absent from it or failed (thereby failing to secure **'C'** grade or above) may re-appear for that

course in the supplementary examination as and when it is conducted. In such cases, internal marks assessed in continuous internal evaluation (CIE) earlier for that course will be carried over, and added to the marks obtained in the SEE supplementary/make-up examination. If the student secures sufficient marks for passing, **'C'** grade or above shall be awarded as specified in clause 10.3.

9.0 Distribution of Marks and Evaluation

9.1 The performance of a student in every course (including Value Added Courses and Skill Development Courses, Laboratory/Practical and Project Work) will be evaluated for 100 marks each, with 40 marks allotted for CIE (Continuous Internal Evaluation) and 60 marks for SEE (Semester End-Examination), irrespective of the credits allocated.

9.2 Continuous Internal Evaluation (CIE)

9.2.1 Theory Courses:

For theory courses, during a semester, there shall be two mid-term examinations. Each Mid- Term examination consists of two parts i) **Part – A** for 10 marks, ii) **Part – B** for 20 marks, totaling to 30 marks. Total duration of mid-term examination is two hours.

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

The objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 10 marks.

The descriptive paper shall contain 6 questions out of which, the student has to answer 4 questions, each carrying 5 marks. The **average of the two Mid Term Examinations** shall be taken as the final marks for Mid Term Examination (for 30 marks).

While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus. Questions will be drawn from the mid-term exam syllabus, ensuring uniform coverage of all topics.

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

2. Five marks for the assignment. Student shall submit two assignments and the **average of 2 Assignments** each for 5 marks shall be taken. The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination.
3. Five marks for the Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject. This assessment shall be completed before II Mid-Term Examination. The concerned course faculty shall schedule these sessions in their semester plan approved by the Head of the department.

9.2.2 Engineering Drawing and Computer Aided Drafting Course:

For this course, 20 marks will be allocated for day-to-day assessments conducted during drawing practice sessions**,** and another 20 marks will be allocated for the mid-term

examination**.** In the mid-term examination, students shall attempt any four out of six given questions**.** The first mid-term exam will be conducted in the conventional mode using a drawing board**,** while the second mid-term exam will be conducted using a drawing board/ CAD package**.**

9.3 A **Computer-Based Test (CBT**) in each course is available for students who either:

1. missed one of the two mid-term examinations due to unavoidable circumstances, or
2. attended both mid-term examinations but wish to improve their internal marks.

The CBT will be conducted at the end of the semester and will carry a total of 30 marks. The marks obtained in the CBT will be considered equivalent to those obtained in one mid-term examination. Zero marks will be awarded to students who are absent from the mid-term examination. The average of the best two scores from the three exams (the two mid-term exams and the CBT), combined with other internal assessment components, will constitute the Continuous Internal Improvement (CII) marks for that specific course. CBT exams shall be conducted by the Institute.

9.4 Semester End Examination for theory courses

9.4.1 Theory Courses:

The Semester End Examinations (SEE), for theory courses, will be conducted for 60 marks consisting of two parts viz. i) **Part- A** for 10 marks and ii) **Part - B** for 50 marks.

- Part-A is compulsory, consists of five short answer questions covering all units of syllabus; each question carries two marks.
- Part-B consists of five questions carrying 10 marks each. There shall be two questions asked in the question paper from each unit with either-or choice and the student should answer either of the two questions. The student shall answer one question from each of five units.

9.4.2 Engineering Drawing and Computer Aided Drafting Course:

Question paper consists of five questions carrying 12 marks each. There shall be two questions asked in the question paper from each unit with either-or choice and the student should answer either of the two questions. The student shall answer one question from each of five units.
There shall be no section with short answer questions.

9.4.3 Duration of SEE:

The duration of Semester End Examination of theory and drawing courses is 3 hours.

9.5 Semester End Examination for Practical Courses

For practical courses there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and semester-end examination for 60 marks. The breakup of the continuous internal evaluation for 40 marks is as follows:

1. 10 marks for a write-up on day-to-day experiments in the laboratory (in terms of aim, components/procedure, expected outcome).

2. 10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
3. 10 marks for the internal practical examination conducted by the laboratory teacher concerned.
4. The remaining 10 marks are for Laboratory Report/Project and Presentation, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

The Semester End Examination for practical courses shall be conducted with an external examiner and the laboratory course teacher. The external examiner shall be appointed from the outside institutions.

In the Semester End Examination for practical courses held for 3 hours, rubrics of evaluation for 60 marks is as given below:

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

For any change of experiment, 5 marks will be deducted from the total of 60 marks. If second time change of experiment is requested, another five marks will be deducted from the 60 marks. No third change will be permitted.

9.6 Field-based Research Project:

There shall be a Field-based Research Project in the intervening summer between II-II and III- I Semesters. Students will register for this project immediately after II Year II Semester examinations and pursue it during summer vacation. The Field-based Research Project shall be submitted in a report form and presented before the committee in III year I semester. It shall be evaluated for 100 external marks. The evaluation committee shall consist of an External Examiner, Head of the Department, Supervisor of the Project and a Senior Faculty Member of the department. There shall be no internal marks for Field-based Research Project. Student shall have to earn 40% marks, i.e 40 marks out of 100 marks. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the committee as per schedule, or (iii) secures less than 40% marks in this course.

9.7 Internship/Industry Oriented Mini Project:

There shall be an Internship/Industry Oriented Mini Project in collaboration with an industry from their specialization. Students shall register for this project immediately after III Year II Semester Examinations and pursue it during summer vacation. Internship should be carried out at an organization (or) Industry. The Industry Oriented Mini Project shall be submitted in a report form and presented before the committee in IV Year I Semester before the semester end examination. It shall be evaluated for 100 external marks. The committee consists of an External Examiner, Head of the Department,

Supervisor of the Industry Oriented Mini Project/Internship, and a Senior Faculty Member of the Department.

9.7.1 For evaluating industry-oriented mini-projects, it is preferable to appoint an external examiner from the industry, ideally from one of the organizations/ industries with which the institute has established / proposing to establish collaborations.

9.8 UG Project Work:

9.8.1 The UG project work shall be initiated at the beginning of the IV Year II Semester and the duration of the project work is one semester. The student must present in consultation with his/her supervisor, the title, objective and plan of action of his/her Project work to the departmental committee for approval within two weeks from the commencement of IV Year II Semester. Only after obtaining the approval of the departmental committee, the student can start his/her project work.

9.8.2 Student has to submit project work report at the end of IV Year II Semester. The project work shall be evaluated for 100 marks. Out of which 40 marks and 60 marks are allocated for CIE and External Evaluation respectively.

9.8.3 For internal evaluation, the departmental committee consisting of Head of the Department, Project Supervisor and a Senior Faculty Member shall evaluate the project work for 40 marks. The distribution of marks is as follows:

- Objective(s) of the work done - 05 Marks
- Methodology adopted - 15 Marks
- Results and Discussions - 15 Marks
- Conclusions and Outcomes - 05 Marks

Total - 40 Marks

9.8.4 The External Evaluation shall be conducted by the external examiner for a total of 60 marks. It shall comprise the presentation of the work, communication skills, and viva-voce, with a weightage of 20 marks, 15 marks, and 25 marks respectively.
The topics for main Project shall be different from the topic of Industry Oriented Mini Project/ Internship/SDC. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the External Examiner as per schedule, or (iii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

9.8.5 For conducting viva-voce exam of project work, Institute appoints an external examiner. The external examiner may be selected from the list of experts submitted by the BoS concerned.

9.8.6 A student who has failed, may re-appear once for the above evaluation, when it is scheduled again; if student fails in such 'one re-appearance' evaluation also, he/she has to appear for the same in the next subsequent year, as and when it is scheduled.

9.9 Skill Development Courses:

Four Skill Development Courses are included in the Curriculum in II-I, II-II, III-I and III-II semesters. Each Skill Development Course carries one credit. The evaluation pattern will be same as that of a laboratory course including the internal and external assessments.

The objective of Skill Courses is to develop the cognitive skills as well as the psycho-motor skills.

9.10 Value-Added Courses:

The evaluation of Value-Added Courses shall be similar to that of theory courses. However, the scheduling of these mid-term exams and semester-end examinations may not be combined with main-stream examinations. One hour /45 mins proctored mid-term examination shall be conducted in the regular class by the same subject teacher. It should not impact the conduct of other classes on that day.
The scheduling of the semester-end examinations shall also be intimated by the Institute time to time.

10.0 Grading Procedure

10.1 Absolute grading system is followed for awarding the grades to each course.

10.2 Grades will be awarded to indicate the performance of students in each Theory, Laboratory, Industry-Oriented Mini Project/ Internship/ Skill development course and Project Work. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End

Examination, both taken together) as specified in clause 8 above, a letter grade shall be given as explained in the following clause.

10.3 To measure the performance of a student, a 10-point grading system is followed. The mapping between the percentage of marks secured and the corresponding letter grade is as follows:

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

10.4 A student shall be declared successful or 'passed' in a semester, if he/she secures **'C'** grade or above in every course (ie GP ≥ 5)

10.5 A student who has obtained an '**F'** grade in any course shall be deemed to have '**failed'** and is required to re-appear for a supplementary exam as and when conducted. In such cases, internal marks in those courses will remain the same as those obtained earlier.

10.6 To a student who has not appeared for an examination in any course, '**Ab'** grade will be allocated in that course, and he/she is deemed to have '**Failed'**. Such student will be required to re-appear for supplementary/make-up exam as and when conducted. The internal marks in those courses will remain the same as those obtained earlier.

10.7 The students earn a Grade Point (G) in each course, on the basis of letter grade secured in that course. Every student who passes a course will receive grade point **GP ≥ 5** ('C' grade or above).

10.8 The 'Credit Points' (C) are computed by multiplying the grade point with credits for a given course.

Credit Points (C) = Grade Point (G) x Credits

10.9 The Semester Grade Point Average (SGPA) is calculated only when all the courses offered in a semester are cleared by a student. It is calculated by dividing the sum of credit points (ΣCG) secured from all courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to **two** decimal places. SGPA for each semester is thus computed as

$$\text{SGPA} = \{ \sum_{i=1}^{N} C_i \, G_i \} / \{ \sum_{i=1}^{N} C_i \}$$

where 'i' is the course indicator index (considering all courses in a semester), 'N' is the no. of courses registered for the semester (as listed under the course structure of the branch), C_i is the no. of credits allotted to the i^{th} course, and G_i represents the grade points corresponding to the letter grade awarded for that i^{th} course.

10.10 If a student earns more than 160 credits, only the courses corresponding to the best 160 credits shall be considered for the computation of CGPA of B.Tech. degree.

10.11 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student for the courses correspond to best 160 credits out of **all** registered courses in **all** semesters, and the total number of credits correspond to those selected courses. CGPA is rounded off to **two** decimal places. CGPA is thus computed at the end of each semester, from the I year II semester onwards, as per the formula

$$\mathbf{CGPA} = \{ \sum_{j=1}^{M} C_j \, G_j \} / \{ \sum_{j=1}^{M} C_j \}$$

where '**M'** is the total no. of courses corresponding to the best 160 credits from the courses registered in all eight semesters, 'j' is the course indicator index (takes into account all courses from 1 to 8 semesters), Cj is the no. of credits allotted to the j^{th} course, and Gj represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} course.

Illustration of the Calculation of SGPA:

Course	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	3	O	10	3 x 10 = 30
Course 3	3	C	5	3 x 5 = 15
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A	8	3 x 8 = 24
Course 6	2	A+	9	2 x 9 = 18
Course 7	1	C	5	1 x 5 = 5
Course 8	1	O	10	1 x 10 = 10
	20			152

SGPA = 152/20 = 7.6

The CGPA of the entire B.Tech. programme shall be calculated considering the best 160 credits earned by the student.

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

10.13 SGPA of a semester will be mentioned in the semester Memorandum of Grades if all courses of that semester are cleared in first attempt. Otherwise, the SGPA shall be mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester.

11.0 Declaration of Results and issue of Grade Memo

11.1 While declaring the results, the web-version should display the marks earned by the students with the internal and external marks break-up. However, in the memorandum of grades, the marks need not be shown.

11.2 After the completion of each semester, a certificate of memorandum of grades shall be issued to all the registered students, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, course title, no. of credits), letter grade and credits earned.

12.0 Withholding of Results

12.1 If the student has not paid the fees to the institution at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and the student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

13.0 Supplementary Examinations:

13.1 At the end of each semester, along with regular semester examinations, supplementary examinations shall be conducted for the students who have back-log subjects.

13.2 Advanced supplementary examinations in IV Year II Semester courses may be conducted for those who failed in any course offered in IV Year II Semester. It may enable the students to receive their B.Tech. provisional certificate at an early date. Advanced supply examinations may be scheduled within one month period after the declaration of the final semester results.

There shall be no supplementary examination in the successive semester. The students who could not secure any pass grade in advance supplementary examinations have to wait for regular series examination of next batch to write their back-log examination.

14.0 Promotion Rules

S.No.	Promotion	Conditions to be Fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester and fulfilment of attendance requirement.
2	First year second semester to Second year first semester	(i) Regular course of study of first year second semester and fulfilment of attendance requirement (ii) Must have secured at least 25% of the total credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3.	Second year first semester to Second year second semester	Regular course of study of second year first semester and fulfilment of attendance requirement.

4	Second year second semester to Third year first semester	(i) Regular course of study of second year second semester and fulfilment of attendance requirement. (ii) Must have secured at least 25% of the total credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to Third year second semester	Regular course of study of third year first semester and fulfilment of attendance requirement.
6	Third year second semester to Fourth year first semester	Regular course of study of third year second semester and fulfilment of attendance requirement.
7	Fourth year first semester to Fourth year second semester	Regular course of study of fourth year first semester and fulfilment of attendance requirement.

15.0 Re-admission after Detention

i) A student detained due to lack of credits, shall be promoted to the next academic year only after acquiring the required number of credits.

ii) A student detained due to shortage of attendance shall be admitted in the same semester in the successive academic years.

iii) When a student is readmitted in the following academic years, the academic regulations under which the student seeks re-admission shall only be applicable to this student, not the academic regulations in which he got admitted in his/her first year of study.

16.0 Credit Exemption

A student (i) shall register for all courses covering 164 credits as specified and listed in the course structure and (ii) earn 160 or more credits to successfully complete the undergraduate programme.

- Best 160 credits shall be considered for CGPA computation. The student can avail exemption of courses ***totaling up to 4 credits*** other than Professional core courses, Laboratory Courses, Seminars, Project Work and Field Based Research Project / Industry Oriented Mini Project / Internship, for optional drop out from these 164 credits registered;
- The semester grade point average (SGPA) of each semester shall be mentioned at the bottom of the grade card, when all the subjects in that semester have been passed by the student.
- Credits earned by the student in either a Minor or Honors program cannot be counted towards the required 160 credits for the award of the B.Tech. degree.

17.0 Award of Degree

17.1 A student who registers for all the courses specified in the course structure and secures the required number of 160 credits within 8 academic years from the date of commencement of the first academic year, shall be declared to have qualified for the award of B.Tech. degree in the branch of Engineering selected at the time of admission.

17.2 A student who qualifies for award of the degree as listed in item 17.1 shall be placed in the following classes.

17.3 A student with final CGPA (at the end of the undergraduate programme) ≥ 7.5, and fulfilling the following conditions - shall be placed in '**First Class with Distinction'**:

(i) Should have passed all the courses in '**First Appearance'**.

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

A student not fulfilling any of the above conditions with final CGPA ≥ 7.5 shall

be placed in **'First Class'.**

17.4 Students with final CGPA (at the end of the undergraduate programme) ≥ 6.5 but < 7.5 shall be placed in **'First Class'.**

17.5 Students with final CGPA (at the end of the undergraduate programme) ≥ 5.5 but < 6.5, shall be placed in '**Second Class'**.

17.6 All other students who qualify for the award of the degree (as per item 17.1), with final CGPA (at the end of the undergraduate programme) ≥ 5.00 but < 5.5, shall be placed in '**pass class**'.

17.7 Grace Marks

Grace marks shall be given to those students who complete the course work of four year B. Tech. degree, not secured pass grade in not more than three subjects and adding a specified grace marks enables the student to pass the subject(s) as well as gets eligibility to receive the provisional degree certificate.

Grace marks for students admitted under the R-25 Academic Regulations should not exceed **0.15%** of the total maximum marks in all eight semesters (excluding the marks allocated for value added courses and skill development courses).

18.0 Award of Gold Medals

18.1 Students fulfilling the conditions listed under item 17.3 alone will be eligible for award of '**Gold Medal**'.

18.2 If more than one student secures the same highest CGPA, then the following tie resolution criteria, in the same order of preference shall be followed for selecting the Gold Medal winner, until the tie is resolved: 1) more number of times secured highest SGPAs, ii) more number of O and A+ grades in that order and iii) highest SGPA in the order of first semester to eight semester.

19.0 Conversion of CGPA into equivalent Percentage of Marks

19.1 The following formula shall be used for the conversion of CGPA into equivalent marks, whenever it is necessary

Percentage (%) of Marks = (Final CGPA – 0.5) x 10

20.0 Honours and Minor Degree Programs

Honours and Minor Degree programs will be available in all branches of B.Tech. degree. Minor Degree programs will commence from II Year II Semester and continue till IV Year I semester and Honours Degree programs will commence from III Year I Semester and continue till IV Year II semester.

21.0 Multiple Entry Multiple Exit Scheme (MEME)

21.1 Exit Option after Second Year:

Students enrolled in the 4-Year B.Tech. program are permitted to exit the program after successful completion of the second year (B.Tech. II Year II Semester). The students who desire to exit after the II year shall formally inform the exit plan one semester in advance i.e. at the commencement of II Year II Semester itself. Such students need to fulfil the additional requirements as specified in Clause 21.2 described below.

Upon fulfilling the requirements like earning all the credits up to II Year II Semester and successfully completing the additional requirements, the students will be awarded a 2-Year Undergraduate (UG) Diploma in the concerned engineering branch.

21.2 Additional Requirements for Diploma Award

To qualify for the diploma under the exit option, students must also complete 2 additional credits through one of the following Institute/University-prescribed pathways:

Work-based Vocational Course:

Participation in a practical, hands-on vocational training program relevant to the engineering field, typically conducted during the summer term.

Internship/Apprenticeship:

Completion of a minimum 8-week internship or apprenticeship in their related field to gain practical industry exposure.

In addition, students must clear any associated course(s) and submit the internship/ apprenticeship report as per the University's schedule and guidelines.

21.3 Re-entry into the B.Tech. Program

Students who have exited the B.Tech. program with a 2-Year UG Diploma may apply for re- entry into the Third Year (Fifth Semester) of the B.Tech. program. Re-entry is subject to the following conditions:

- The student must surrender the awarded UG Diploma Certificate.
- Students who wish to rejoin in III Year must join the same B.Tech. program and same college from which the student exited. Before rejoining, students should check for continuation of the same branch at the college. If the specific branch is closed in that particular college, then student should consult the University for the possible alternative solutions.
- Re-registered students will be governed by the academic regulations in effect at the time of re-entry, regardless of the original regulations under which they were admitted.
- If a student opts to continue his/her studies without a gap after being awarded the diploma, they must register for the third-year courses before the commencement of classwork.

21.4 Break in Study and Maximum Duration

Students are allowed to take a break of up to four years after completion of II Year II Semester with prior Institution/University permission through the Head of the Institution.

Re-entry after such a break is subject to the condition that the student completes all academic requirements within twice the duration of the program (i.e., within 8 years for a 4-year B.Tech. program).

22.0 Transitory Regulations for the students re-admitted in R-25 Regulations:

22.1 Transitory regulations are applicable to the students detained due to shortage of attendance as well as detained due to the shortage of credits and seek permission to re-join the B.Tech. programme, where R-25 regulations are in force.

22.2 A student detained due to shortage of attendance and re-admitted in R-25 regulations: Such students shall be permitted to join the same semester, but in R-25 Regulations.

22.3 A student detained due to shortage of credits and re-admitted in R-25 regulations: Such students shall be promoted to the next semester in R-25 regulations, only after acquiring the required number of credits as per the corresponding regulations of his/her previous semester.

22.4 A student who has failed in any course in a specific regulation has to pass those courses in the same regulations.

22.5 If a student is readmitted to R-25 Regulations and has any course with 80% of syllabus common with his/her previous regulations, that particular course in R-25 Regulations will be substituted by an equivalent course of R-22 regulations by the University. All these details are summarized in a set of look-up Table; one set for each B. Tech. branch.

22.6 Look Up Table of equivalence courses

22.6.1 A lookup table will be provided for the benefit of students. This lookup table will include all the courses to be registered by students who have been re-admitted under the R-25 Academic Regulations from the R-22 Academic Regulations. Separate lookup tables will be provided for the following categories of students:

1. Students re-admitted into the I Year II Semester of the R-25 Regulations
2. Students re-admitted into the II Year I Semester of the R-25 Regulations
3. Students re-admitted into the II Year II Semester of the R-25 Regulations
4. Students re-admitted into the III Year I Semester of the R-25 Regulations
5. Students re-admitted into the III Year II Semester of the R-25 Regulations
6. Students re-admitted into the IV Year I Semester of the R-25 Regulations
7. Students re-admitted into the IV Year II Semester of the R-25

Regulations For every B.Tech. branch there shall be separate set of seven lookup tables.

22.6.2 Applicability of Look-up Table: The above look-up table shall be applicable for students who seek readmission from R-22 regulations to R-25 regulation and are going to be re-admitted in the same R25 regulations of the Institute.

22.6.3 These look-Up Tables are not applicable for the students who seek transfer from other Universities /Institutions (Autonomous/ Non Autonomous) to our institution. Such students should consult the Institution/University regarding equivalent courses.

22.7 The R-25 Academic Regulations are applicable to a student from the year of re-admission. However, the student is required to complete the study of B.Tech. degree within the stipulated period of eight academic years from the year of first admission.

23.0 Student Transfers

23.1 There shall be no branch transfers after the completion of admission process.

23.2 The students seeking transfer to the Institution from other Universities/institutions have to pass the failed subjects which are equivalent to the subjects of our Institution, and also pass the subjects of the Institution which the students have not studied at the earlier institution.

23.3 The transferred students from other Universities/Institutions to our institution, shall be given a chance to write CBTs for getting CIE component in the **equivalent course(s)** as per the clearance letter issued by the Institution.

24.0 Value Added Courses

24.1 Faculty members who have received a certificate in Innovation and Entrepreneurship / Entrepreneurship from a reputed foundation/organization may be given preference to teach the "Innovation and Entrepreneurship" course. This certificate course should include an assessment. Total training duration (online or physical), excluding assessment, should be at least 30 hours. Faculty members from all disciplines with innovative mindset and aptitude to co-create an entrepreneurial ecosystem are eligible to teach this subject.

24.2 Faculty members who have credited a course on Intellectual Property Rights in their UG or PG programme or credited an equivalent course in MOOCs platform/ reputed foundation/ organization in which assessment is a part, may be given preference to teach the elective course on Intellectual Property Rights.

24.3 To ensure quality delivery and standardization in teaching the **Indian Knowledge System (IKS)** and other value-added courses, the following guidelines must be adhered to: i) faculty members must undergo a Faculty Development Program (FDP) organized by UGC-MMTTC (Malaviya Mission Teacher Training Centre), **or** Any other recognized and competent institution/organization offering similar certified programs, ii) the total instructional duration of the FDP should be a around 32 hours or more, III) all sessions in the FDP must be conducted by certified and qualified resource persons with recognized expertise in the respective domains,
iv) A formal assessment component must be included as part of the FDP.

25.0 Mapping with the Sustainable Development Goals

All the courses specified in the course structure of every programme are mapped with the one or more sustainable development goals.

26.0 Scope

26.1 The academic regulations should be read as a whole, for the purpose of any interpretation.

26.2 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Head of the Institution is final.

26.3 The Institution/University may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the dates notified by the Institution/University authorities.

26.4 Where the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".

27.0 Guidelines for Scribe to appear for examinations

The Candidates who desire to take the Scribe to follow the steps mentioned here under

27.1 Medical Certificate issued by a Civil Surgeon working in a Government Hospital.

27.2 Photo of the student / candidate highlighting the inability to appear for the examination.

27.3 Committee consisting of Head of the Institution, Controller of Examinations and Head of the department will scrutiny the candidate previous academic performance and regularity.

27.4 After the approval of the committee, it is required to submit the following documents of scribe

27.5 The Particulars of proposed scribe i.e., name, address, qualifications and present occupation. The scribe should be of intermediate qualification with arts subjects only.

27.6 A letter from the scribe stating that he /she is willing to act as scribe.

27.7 A copy of the certificate of scribe's qualification along with recent photograph duly attested by the Controller of Examination.

27.8 A letter from the Controller of Examination stating that he/she personally verified and satisfied regarding qualification of the scribe as per norms and that he/she will provide a separate room and invigilator for all the examinations of the candidate.

*****

NALLA NARASIMHA REDDY EDUCATION SOCIETY'S GROUP OF INSTITUTIONS (UGC AUTONOMOUS INSTITUTION)

Chowdariguda(V), Korremula 'X' Road, Ghatkesar(M), Medchal-Malkajgiri(D), Hyderabad. – 500088, T.S

ACADEMIC REGULATIONS FOR B.TECH. (LATERAL ENTRY SCHEME) FROM THE AY 2026-27

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

1. The LES students after securing admission shall pursue a course of study for not less than three academic years and not more than six academic years.
2. The student shall register for 123/124 credits and secure 120 credits with CGPA ≥ 5 from II year to IV-year B.Tech. programme (LES) for the award of B.Tech. degree.
3. The student can avail exemption of courses **totaling up to 3/4 credits** other than Professional core courses, Laboratory Courses, Seminars, Project Work and Field Based Research Project / Industry Oriented Mini Project / Internship, for optional drop out.
4. The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.
5. The attendance requirements of B.Tech. (Regular) shall be applicable to B.Tech. (LES).
6. **Promotion rule**

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to Second year second semester	Regular course of study of second year first semester and fulfilment of attendance requirement.
2	Second year second semester to Third year first semester	(i) Regular course of study of second year second semester and fulfilment of attendance requirement. (ii) Must have secured at least 25% of the total credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to Third year second semester	Regular course of study of third year first semester and fulfilment of attendance requirement.
4	Third year second semester to Fourth year first semester	Regular course of study of third year second semester and fulfilment of attendance requirement.
5	Fourth year first semester to Fourth year second semester	Regular course of study of fourth year first semester and fulfilment of attendance requirement.

7. All the other regulations as applicable to B.Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).
8. LES students are not permitted to exit the B.Tech. program after completion of second year (B.Tech. II Year II Semester).

III. VISION & MISSION

VISION:

To be a premier institution ensuring globally competent and ethically strong professionals

MISSION:

1. To provide higher education by refining the traditional methods of teaching to make globally competent professionals
2. To impart quality education by providing state of the art infrastructure and innovative research facilities
3. To practice and promote high standards of professional ethics, transparency and accountability

HUMANITIES & SCIENCES

VISION:

To foster the excellence of analytical, critical and speculative approaches of the physical sciences and English so as to provide a firm foundation for intellectual and creative experiences as well as to enrich students' lives enabling them to meet the needs of the society.

MISSION:

The department plays a pivotal role in preparing the students to face the challenges at the global level by imparting intensive training in English communication skills, ethics, Mathematics, Physics, Chemistry and Environmental studies. It offers a platform to exhibit their hobbies such as literature, photography, etc, providing respective clubs and related faculty in the college.

IV. QUALITY POLICY

We practice excellence in our teaching and research, nurturing education with Human Values. We emphasize quality education by adopting latest teaching methodologies through state of the art infrastructural facilities. NNR Education Society's Group of Institutions believes in self evaluation and continuous improvement.

V. GENERAL INFORMATION

Nalla Narasimha Reddy Education Society's Integrated campus was established in 2009 to educate, enrich and empower the youth. NNRG provides the best technical education by maintaining the standards and quality of engineering education. The endeavour of the institution stretches beyond just offering a degree towards building a good character of the young professionals in shaping them to serve the nation and humanity. It imparts technological competence and social consciousness in the new undergraduates.

VI. LOCATION & ACCESS

The campus is located amidst sprawling and lush green surroundings with an amicable atmosphere for learning. NNRG's integrated campus is about 17 kms from Secunderabad

& Koti and 10 Kms from Uppal Ring road on Warangal Highway. The campus is accessible by public transport system and it takes a 15 minute drive from Uppal to reach the campus. The state RTC runs city buses frequently to Ghatkesar, Korremula and Narapally. The Institute provides college buses in various routes for faculty, staff and students and also runs TSRTC Bus specially plying from NNRG Institution to Uppal X Road.

VII. COURSES@NNRG

<table>
<tr><td colspan="2">SCHOOL OF ENGINEERING</td></tr>
<tr><td>UG - B.Tech</td><td>PG - M.Tech</td></tr>
<tr><td>Computer Science & Engineering (CSE)
Computer Science & Engineering (Data Science)
Computer Science & Engineering (Artificial Intelligence & Machine Learning)
Electronics and Communication Engineering (ECE)
Civil Engineering(CE)</td><td>Embedded Systems &VLSI</td></tr>
<tr><td colspan="2">SCHOOL OF PHARMACY
• B. Pharmacy</td></tr>
<tr><td colspan="2">SCHOOL OF MANAGEMENT SCIENCES
• MBA</td></tr>
</table>

VIII. CENTRAL FACILITIES

1. Infrastructure

The Campus main building includes the academic and the administrative blocks with well-resourced laboratories in various departments. The classrooms are spacious and well ventilated. The campus has a large playground, basket ball and football courts. The college has a well maintained canteen. RO purifying water plants, hygienic washrooms and other amenities.

2. Internet Facility

The campus systems are connected within intranet sharing facility to a central server. As part of the research and practical work, students can access the internet facility in all working hours. It provides access to e-books, study materials, previous question papers, teaching schedules, internal marks, attendance reports, daily circulars and many. A productive e learning atmosphere is promoted through the college Local Area Network (LAN), internet facility with 600 Mbps band bandwidth.

3. Auditorium

NNRG has a well-structured auditorium with a seating capacity of 600 with latest provisions. It is spacious and provides the right ambience for presentations, interactive sessions, as well as national and international conferences.

4. Sports & Games

NNRG believes that **Physical** fitness plays an important role in developing the overall personality of a student. The institute endeavors to foster overall development of students both in academic and sports fields and includes sports and games as an integral part of the curriculum. The college has extensive sports infrastructure and environment to encourage students to excel in them. The students are trained to improve physical fitness, mental ability,

team spirit and discipline. NNRG has indoor sports and outdoor fields for athletics, cricket, badminton and basketball courts. Our students have participated in annual Inter-College, Inter-University and National level Sports Festivals and won laurels. The sports department is led by a full time Physical Director and competent staff.

5. Cafeteria

The institute has an ideal cafeteria that takes utmost care in providing hygienic and quality food at subsidized rates. The authorities take personal care in maintaining the quality of food served in the canteen. The canteen is amidst large and vibrant area, with a beautiful view of greenery all around. The canteen is most popular place among students on campus for food, student bonding and informal discussions.

6. Pure & Hygienic Drinking Water

NNRG campus has installed RO water purifying systems for the students and staff. Purified drinking water is supplied to all the departments/blocks. Water coolers are available in each building/block.

7. Girls Hostel

An exclusive girls' hostel is built on a 2 acre campus. The hostel provides a homely atmosphere for the students who come from city outskirts and distant places. It provides a secure environment for them to excel in studies. 24 hours security and emergency medical services and also an ambulance service is exclusively provided for the benefit of the students. The students develop a sense of responsibility and learn to manage their lives independently staying in hostels.

8. Transport

The institution provides transport to students and staff from all parts of the city to the campus. The buses are comfortable and safe in the hands of well trained drivers.

9. Seminar Halls

The college has spacious, furnished and well equipped seminar halls with audio visual facility, one for each department which can accommodate about 300 students, where departmental activities like Student Seminars, PowerPoint Presentations, Group Discussions, and Mock Interviews, etc. are conducted.

10. Center for online exams

NNRESGI maintains International standards in obtaining the best computer technology. This made NNRESGI the hub for online exams like GATE, CAT, RRB, IBPS, Govt. Entrance exams, TCS, Infosys, Deemed university entrance exams like SRM, Amrutha, CMC, etc.

11. Dispensary

The institution has its own dispensary for medical supplies and treatment. A senior doctor's medical advice is always available to all the students and staff.

12. Stationery Store

A stationery store is available in the college campus from where students can purchaseall stationery items for their day to day requirement at affordable prices.

13. ATM

An ATM center of HDFC bank is opened in the college premises for smooth and hassle- free money transactions.

IX CAMPUS OVERVIEW

- Picturesque 12- Acre Campus
- 3,00,000 Sft built-up area
- Well Qualified and Experienced faculty
- State-of- the art Laboratories
- High level safety standards at Laboratories
- Advanced English CommunicationSkills Laboratories
- Department - wise Seminar Halls
- 1200 LAN connected High Configuration Computers
- Central Seminar Hall & Auditorium
- Internet with 600 Mbps Bandwidth
- Well stacked, spacious library with a number of volumes and National & International Journals
- Digital library
- Research & Development Centre
- Training and Placement Cell
- Industry-Institute Interaction Cell
- Center for Human Excellence
- Entrepreneurship Development Cell
- CPCSEA approved animal house
- Incubation Centre
- Robotics Centre
- Professional Societies & Clubs
- WiFi enabled Campus
- Sports and Games Department
- NCC & NSS Units
- Cafeteria
- Girls Hostel
- Dispensary
- Stationery stores
- Transport facility
- Medicinal Garden

X. GUIDELINES, RULES AND REGULATIONS OF THE CAMPUS

A. GENERAL

1. Dress Code

Students should wear formal clothes.

2. Ragging and Indiscipline

Ragging is strictly prohibited on the campus. Any student found guilty would be severely punished. All senior students of the college are aware of the consequences of ragging. Students who misbehave with staff or other students will also be penalized. If students are involved in smoking, liquor consumption or in fights, they will be punished as per the Institute norms.

3. College Timings

The college commences at 09.00AM and ends at 04:00 PM with 45 minutes lunch break 12:15 PM to 1:00 PM. Students must strictly adhere to the timings of the college. They should not linger inthe college premises or outside the classrooms when the classes are in progress.

4. Bonafide Certificates

The Academic branch issues bona fide certificates for bus passes and other purposes tothe college students.

5. Bus Passes

College bus ID-cards will be issued by the transport in-charge. NNRG's Administrative Officer will attest TSRTC bus pass applications.

6. Notices/Notice Boards

Students are expected to read the College, Department and the Exam Branch notice boards regularly. The Main notice board is available at the entrance of the Engineering block.

7. Original Certificates

Students' Original certificates have to be deposited with the college and the same will bereturned after the completion of the course.

8. Memorandum of Marks

The memorandum of marks of a particular year/semester will be issued by the Examination branch.

9. Intimation of Change of Address

Students are required to intimate the change in Address or Phone number immediately ifany, to the academic branch through their Class Mentor or HOD.

10. Wearing ID cards

College Identity card is mandatory for all the students as long as they are in the college premises. They are not allowed to attend the classes or labs or write the examinations without their identity cards.

11. Obtaining Gate Passes

Students found bunking classes or leaving the college without prior permission will not be permitted to attend classes on the next day until proper explanation is provided by the student or the parent/guardian to the Head of the Department concerned. In case of emergency, studentcan approach the class in-charge for a gate pass. The Class in-charge can issue the gate pass after receiving the consent of the parents and approval of the HOD.

12. Ban on Usage of Mobile Phones

To prevent distractions caused by mobile phones, students are not permitted to use mobiles in the college campus. If any student is found using a cell phone in the campus, disciplinary action will be taken.

13. Absenteeism

No student is supposed to be absent from the class without prior permission of the HOD. If a student is absent for three days continuously without reason/prior permission, disciplinary action will be taken. The student must submit a leave application in advance to the HOD if they want to go on leave for a day and for a valid reason.

14. SMS service

If a student is absent, an SMS will be sent to the parent's mobile (registered mobile) by afternoon on the same day. Parents and students are advised to download the **-UOLO** app for any important communication from the institute/department and requested to respond appropriately.

15. Electronic Items for Music and Entertainment

No musical gadgets are allowed in the college campus. If any student is found using such items, the items will be seized and disciplinary action will be initiated.

16. Discipline in Buses

The students must commute in the allocated buses. In case of emergency, they will be permitted to change route with the permission of the authority/bus In-charge. If any student's behavior is found objectionable to the staff or other students, disciplinary action will be taken. No student is permitted to travel without the bus ID card.

17. Punctuality

Students have to be punctual to their classes. In case of delay to the class, the student may be permitted to attend the class with the permission of their respective Department Head. If the student is a regular late comer, appropriate disciplinary action will be taken.

18. Leave/Sick Leave

If the absence is on medical grounds, students are required to notify their HOD for being absent and submit the medical certificate the next day. Disciplinary action will be initiated if any student is absent without information to the Class In-charge/HOD for more than three days.

19. Assignments/Lab Records Submission

Students are supposed to submit their Lab records and Assignments given by the faculty concerned and get them corrected and graded in time. Late submission is not acceptable.

RAGGING:

- Ragging is uncivilized besides being an offence.
- Students must not involve in ragging.
- Ragging is prohibited as per Act 26 of T.S. Legislative Assembly -1997.
- Ragging entails heavy fine and/or imprisonment.
- Ragging invokes suspension and dismissal from the college.
- Outsiders are prohibited from entering the college and hostel without permission.
- Girl students must be in their hostel rooms by 6:00pm.
- Suspended students are debarred from entering the campus except when required to attend enquiry and to submit an explanation.
- Whenever any student complains about ragging, that complaint shall be enquired into or an enquiry will be made into the same forthwith and if the complaint is found true, the student(s) complained against shall be suspended for a period as may be deemed necessary.
- Every student has to give an undertaking to the college that he/she will not indulge in ragging.
- Every student's parent/guardian is also required to give an undertaking that they will ensure that their son/daughter/ward will not indulge in ragging and also comply with all the guidelines, rules and regulations concerning prevention of ragging.
- All students should carry identity cards with them both inside and outside the college.
- An Anti Ragging committee is constituted with senior faculty to carry out its activities.

Prohibition of Ragging

- Ragging within or outside the Educational Institution is prohibited.
- Ragging means doing an act which causes or is likely to cause insult or annoyance or fear or apprehension or threat or intimidation or outrage of modesty or injury to a student.
- The punishment at different levels is mentioned below.

S.No.	Nature of Ragging	Punishment
1	Teasing, embarrassing and humiliating	Imprisonment up to 6 months or fine upto Rs.1,000/-
2	Assaulting or using criminal force or criminal intimidation	Imprisonment up to 1 Year or fine upto Rs.2000/- or both.
3	Wrongly restraining or confining or causing hurt	Imprisonment up to 2 years or fine upto Rs.5000/- or both.
4	Causing grievous hurt kidnapping or raping or committing unnatural offence	Imprisonment up to 5 years and fine up to Rs.10,000/-
5	Causing death or abetting suicide	Imprisonment up to 10 years and fine upto Rs.50,000/-

Note:

- A student convicted of any of the above offences will be dismissed from the college.
- A student imprisoned for more than six months for any of the above offences will not beadmitted in any other college.
- If a student commits suicide due to or in consequence of ragging, the person who committed such ragging shall be deemed to have abetted such suicide.
- The full text of Act 26 is placed in the college library.

B. Examinations:

Students are advised to refer to the copy of regulations (R22) issued by the university/JNTUH website to be aware of the rules and regulations.

C. Malpractice:

Students must not indulge in any malpractice in the Internal/External examinations.

Malpractice cases are dealt with as per the rules/guidelines of JNTU Hyderabad.

D. Laboratory Guidelines:

- Students are expected to be punctual and regular to the lab classes and follow the labdress code.
- They are expected to carry out all the experiments prescribed by the University.
- They will not be permitted to attend the end practical examinations unless they carry out the minimum number of experiments prescribed by the University.
- They are required to attend the lab fully prepared, with a clear understanding of the concept of the theory underlying the experiment and other experimental details with a plan about how to carry out the experiment after referring to the lab manual.
- Observation notebooks should be neatly maintained. Experiments must be recorded only in the books approved by the departments/college.
- Observation notebook must be shown to the faculty In-charge of the lab and signed by the teacher at the end of the experiment/exercise.

- Records must be submitted as per the schedule prescribed by the faculty In-charge of the lab and must be certified before appearing for the end examinations.
- Students must handover the equipment to the technician in good condition before leaving the lab.
- Students must maintain utmost cleanliness in the lab. Breakages/damages of equipment have to be reported immediately to the lab in-charge.
- Students are advised to clear all dues to the lab before taking end practical examinationsto avoid complications at a later date.
- Laboratory session marks will be awarded on the basis of continuous evaluation.
- Students must clear the work bench soon after the experiment is over.
- Waste material, if any, must not be dropped on the floor of the laboratory. Students should use the waste material baskets kept for the purpose.
- Experiments need to be carried out following all the instructions meticulously and observing all the precautions to avoid personal injuries and damage to equipment.

E. Undertaking from Students and Parents:

Students, parents/guardians need to sign an undertaking in a prescribed form by the college at the time of admission process that they shall adhere to the college rules and regulations. Student who has taken admission in this Institute shall be deemed to have agreed to the rules and regulations of the Institute as given in the handbook. Change of rules if any are to be en-corporated.

F. Class Review Committee (CRC):

The Class Review Committee is constituted for each class. The Class In-charge nominates three students (on good, average & below average basis) from each section through the HOD concerned to know the students' response about the class work. The CRC meets twice a month to review the coverage of syllabus; progress of students; extra classes to be arranged; and resolves students' inhibitions and concerns in the problematic subjects.

G. NOTIFICATION OF STUDENT ABSENCE AND ACADEMIC PERFORMANCETO PARENTS (LETTERS AND SMS)

In order to ensure that the students are regular to college and to be aware of their safety, the institute sends text messages to parents when their child is absent from the class. This is done soon after the first hour so that parents are kept informed.

Parents will be informed about their ward's performance through SMS and their examination results posted from time to time. Parents can contact the HOD/Class In-charge as and when required. The parents are expected to keep in touch with the Class In-charge/HOD and monitor the academic progress of their ward. If the student's attendance /academics is poor the parent should report immediately to review the situation.

PARENT-TEACHER MEETING:

One of the most important features of NNRESGI is the Parent-Teacher Meeting conducted every semester for all the students. It aims at keeping the parents informed about their child's academic and personal progress.

1. Girls' Hostel:

Rules of Admission:

- Students who join the hostel have to pay the prescribed admission fee and caution depositat the time of admission.
- Admission shall be made only after clearing all the dues to the college and previous dues(if any) to the hostel.
- Separate Identity Card will be issued to every student who stays in the college hostel. Suspension/dismissal of a hostel (residential) student from the college will automatically result in her suspension/dismissal from the hostel.

Rules of Discipline

- Every inmate should return to the hostel by 5 p.m.
- Inmates are not allowed to leave the hostel. However, in exceptional circumstances they may take permission from the warden if they need to go outside. Leaving the hostel without the written permission of the warden shall be considered a violation of hostel rules and will be dealt seriously.
- All inmates must carry their college identity cards whenever they leave the hostel premises. They will be permitted to enter the hostel only after producing the identity cardat the hostel main gate.
- Parents/guardians of inmates will be allowed to visit their daughter/ward between 5 p.m. and 6 p.m. on all college working days and between 8 a.m. and 6 p.m. on Sundays and other college holidays. Visitors will be allowed to meet the inmates after making required entries in the visitors' register.
- No inmate will be permitted to go out with parents or local guardians without prior and proper authorization from the warden. Any request for permission from parents to take their daughter/ward out during college working hours will not be granted.
- No inmate will be permitted to go home except during vacation.
- Hostel students are not allowed to stay in the hostel rooms during the college timings.
- Collective gatherings of any kind are prohibited within the hostel premises.
- Students living in the hostel should not indulge in any act or activity that is unacceptable or detrimental for the smooth and proper running of the hostel.
- Residential students shall be held responsible for any damage caused to hostel property and the loss to the property shall be recovered from them.
- Hostel students are prohibited from using any electronic or power consuming applianceswithout the permission of the warden.

XI. LIBRARY

The Central Library has state-of-the-art facilities with books both in print and digital formats. Spread in an area of 1500 Sqmts, the library has separate lending, reading, periodical and digital library sections. The fully computerized library with online public access catalogue system contains over 35,000 volumes covering about 5,000 titles. Apart from textbooks, it has a large number of reference books, national and international journals, magazines and e-journals. NNRG's central library has institutional membership with DELNET, National Digital Library (NDL) and subscribed IEEE, ASME & J_Gate e – journals. Using the On-line Public Access Catalogue (OPAC) system, these can be accessed through intranet. The library has an Integrated Library Management Software Package called KOHA.

The digital library is equipped with 32 latest systems and provides 50 Mbps internet

connection exclusively.

- Books 35,000
- CD/DVD's 500
- Project Reports 1500
- Print Journals 228
- Online Journals 600+
- E-Books 200+

LIBRARY FEATURES

- Book lending facility for students and staff
- The library has subscription to 228 International and National print journals and around 600 e-journals through DELNET, IEEE, ASME, Sage and J - Gate Publications.
- The reference section is a spacious enclave containing books on GATE, TOEFL, GRE, GPAT, General Studies, encyclopedias, dictionaries, handbooks, theses and prescribed textbooks.
- The Digital Library has 32 latest version systems connected through LAN and internet with 50 Mbps band width. It has a complete collection of NPTEL video lectures of IIT experts.
- Print and replication related stationery assistance is made available.

The detailed Rules and Regulations of the Library are displayed on thelibrary Notice Board.

LIBRARY RULES AND REGULATIONS:

- Members / Users have to show their I.D cards, while entering the Library and write their name, branch, Roll.no., time and sign the Register kept at the entrance.
- Keep all the belongings at the entrance and take only one note book or loose sheets.
- Files, bags, personal text books are not allowed inside the Library.
- No person shall write on, damage or make any mark on any book, journal or other materials belonging to the Library.
- The borrower shall be responsible for any damage or loss done to the Library documents borrowed by them and shall be required to replace such material or to pay the Triple cost thereof.
- Before leaving the Library, the reader shall leave on the table any books/periodical, which he/she has taken for reference. The same shall not be kept back on the shelf by the reader to avoid misplacement.
- Maintaining peace, silence in the Library is a must.
- Loss of borrower books has to be reported immediately to the Librarian in writing.
- Members should take care of their personal belongings. The Library is not responsible for any claim of loss of such articles. However, notice will be put if such articles found in the Library.
- Cell phoning and consuming chocolates, etc., in the Library is strictly prohibited.
- Any infringement of the norms and procedures will render the privilege of admission and borrowing reading materials from Library liable to suspension.

- Librarian reserves the right to recall at any time any book issued from the library. Librarian is also empowered to terminate the loan facility to any borrower, if he/she is found to infringe on library rules.
- Library books are issued on barcode based circulation method, please produce ID cards while borrowing books in the circulation counter.

ISSUE OF BOOKS AND PERIODICALS:

- Members of the Library may borrow three books for MBA and Three Books for B.Tech. and B. Pharmacy at a time for a period of 15 days.
- Books can be renewed only once at one given period provided there is no reservation for them.
- Students who fail to return the books on or before due date will have to pay a penalty of Rs. 1/- per day from the due date.
- Reference books and current journals are not for issue. They should be referred within the library only.

LIBRARY SERVICES:

- Xerox is available with nominal charges.

LIBRARY HOURS:

- 9.00 am to 5.00 pm

XII. TRAINING & PLACEMENT CELL

The Training and Placement Cell is an important link between students and industry. We at NNRG are extremely earnest about guiding students in their career path and development. The T&P cell inculcates professional attitude, ethics, and overall personality development in students. It trains them in team building, group activities, mock interview sessions and leadership abilities.

We provide them with hands-on training by providing opportunities to work, interact with entrepreneurs through lectures, seminars, and group discussions. Distinctive focus is given to all- round development through confidence building, teamwork abilities, and exhaustive English communication classes, enhancing their employability skills. It prepares them for future challenges not only by enhancing their academic knowledge but by improving qualities such as taking responsibilities, communication, decision making and interpersonal skills. The Cell trains the students to face Interviews through live recruitment situations. It instills confidence in students to face Interviews and come out with flying colours.

INCUBATION CENTRE:

The Incubation centre is an educational project which provides specially designed incubators for colleges within the premises. Once a student registers for the course, collaboration ensures the overall development of the student ranging from technical training to personality development which widens the chances for the students to achieve the best in the competitive job market.

ROBOTICS DEVELOPMENT CENTRE:

The Robotics centre provides students a platform for practical application of technology and learning from their curriculum by participating in interestingly designed problem solving tasks.

RESEARCH AND DEVELOPMENT COMMITTEE:

In order to encourage and motivate the faculty and students towards the research and development, the institute has established a separate R&D consultancy and External Funded Project Cell. Faculty and students are motivated to write and publish research articles in various national and international journals. The R&D Committee also encourages the faculty and students to participate in various national and international conferences, workshops, and seminars, etc.

MAJOR RESEARCH FACILITIES:

a. Cadence Tools
b. DSP development boards on floating point TMS320C6713
c. MATLAB
d. ProE and ANSYA software tools
e. CNC Milling Machine
f. IOT Labs
g. 3D Printing

Training Programs and Facilities

- Aptitude and Verbal training sessions
- Coding Skills and Skill Development Programs
- Group discussion and Mock Interview sessions
- Personality Development Classes
- Soft skills and Employability skills workshops
- Mock written tests, Group discussions, interviews
- Expert classes for GATE, GPAT, CAT, GMAT, TOEFL, GRE, IELTS etc.
- Industrial visits
- Advanced Communication Skills Lab

The institute has maintained excellent consistency in the placement of the students backed by exceptional placement infrastructure. NNRESGI has been consistently improving its placement record by placing students in various reputed organizations. The Placement Cell at NNRESGI offers excellent guidance to the students by helping them gain necessary skills and practical knowledge of respective engineering domain. The institute offers several on-campus and off-campus activities to enhance the employability of the students. Some of our prominent recruiters are as follows

XIII. STUDENT ACTIVITIES

NNRG's ANNUAL TECHNICAL FESTS – **Tech Samprathi** is the annual technical festival of Nalla Narasimha Reddy Education Society's Group of Institutions. It is a Three-Day National Level Student Symposium organized every year. This fest aims at providing a platform for the student community in and around our nation to develop and showcase their technical prowess. The emphasis at **Tech Fest** is on technology and its applications rather than just on the engineering know-how. It offers a conductive stage for innovation in all the students and also instills social and environmental responsibility among innovators creating a platform for effective collaboration between technical fests and nation building.

Tech Samprathi has several distinguished events.

Technical Event: Paper Presentation, Project Expo, Poster Presentation, App Expo and C Terror. Non-Technical Event: Short Film, Devinette (quiz), (riddle) Caricature, Model United Nations. This year Tech Samprathi also hosted intern College Cultural and Sports festival.

Elite Gathering:

ELITE GATHERING is conducted in the campus every fortnight. During the club activity all the students and the staff of NNRESGI gather at the Assembly Point of the campus the activities are carefully planned to enhance the confidence of the students. It gives them a platform to practice and communicate without any inhibitions, and to impart industry-specific skills needed.

The students who are selected through screening test deliver speeches on various topics given. Elite Gathering also conveys ongoing and upcoming events of the campus. The aim of conducting the assembly is to build confidence and interest in the students, to enable them to improve their communication skills and to develop public speaking skills along with thought process culmination. All the interested students exhibit their talent irrespective of their academic performance.

Center for Human Excellence:

NNRESGI established a Center for Human Excellence in association with Vivekananda Institute of Human Excellence, Ramakrishna Math, Hyderabad. The center aims to impart the age-old cherished ideals, values and the words of Swami Vivekananda, life-building, man-making, character-building, education and training in order to build a stronger nation. The Programs conducted under this wing aim to instill faith in oneself and impart nobler values of life and life- giving strength, to raise individuals to higher levels of strength and felicity with spiritual, moral, ethical and eternal values of personality development and human excellence.

Center for Human Excellence wing, NNRESGI conducts programs frequently in the campus. Eminent philosophical gurus as speakers and monks from VIHE invigorate the young minds.

E-Plus Club:

The E-Plus club activity is an initiative of The Hindu (newspaper) group. It was inaugurated in 2012. The club aims at recognizing the importance of excellent communication skills, sound reasoning, and the confidence to present one's ideas and opinions clearly. E-Plus club undertakes group activities that help students practice English through debating skills, etc. No tests or exams are involved, and students are encouraged to be adventurous, to experiment, and to actually use English instead of just learning about it.

Model United Nations (MUN)

MUN is an educational recreation. It is an academic activity in which students can learn about diplomacy, international relations, and the United Nations. MUN involves researching, public speaking, debating, and writing skills, in addition to critical thinking, teamwork, and leadership abilities.

Photography Club:

The Club –started its journey in the year 2012. It is a student-led club focused on bringing together students who share a passion for photography. Our purpose is to explore various topics within photography and help our members learn and grow within their art.

Literary Club:

The Literary club was established in 2012. It is a platform which instills fondness for language and enhances the students' literary skills. The club provides exciting social and cultural events for students such as creative writing, poetry recitation, mock press conferences, debates and elocution competitions to prune various forms of creative expressions of students.

Yoga and Meditation Club:

The Club was inaugurated on 21st June, 2016. The club aims at teaching and training the students in techniques for resting the mind and attaining a state of consciousness that is totally different from the normal waking state. It is the means for experiencing the center of consciousness within. The goal of the Club is to go beyond the mind and experience our essential nature—which is described as peace, happiness and bliss, busting the stress caused by the highly competitive and stressful life and discovering mental and physical energy generators, wonderful abilities, peace and bliss hidden within ourselves.

Mathematics Club:

The Mathematics Club was inaugurated on 22 December 2015. Its objective is to train students with Mathematics logics through games like Sudoku, Rubric's Cube, etc. It aims at making the students aware and helping them to learn about eminent mathematicians and the history of Mathematics through paper presentations. The club creates curiosity in the students to research and keep themselves updated in the latest mathematical developments and applicationsin engineering.

C-Wizard Club:

The event is organized to enhance the students' knowledge of C Language. It is a quiz competition which elevates their computer skills.

Science Club:

The Science Club organizes model exhibition every year to give the students a platform to exhibit their knowledge and creativity and also encourage other students who do not usually participate in extra and co-curricular activities. It is a strong base for many students to launch their ideas and build on them carrying it forward into their professional lives.

Art/Culture Club:

Apart from the regular academic curriculum it is also very important for the students toget involved in the various cultural and other activities which will bring out their hidden talents. Art and Culture Club established in the institute to encourage students to take part in these activities. These activities will help the students to have a holistic growth. Through this students are given an opportunity to collaborate with various media, to exhibit the inherent talents. Such programs give them the societal exposure for public interaction.

Apart from the regular activities of various clubs, the institute also celebrates many events like World Environment Day, Engineers' Day, Ramanujan's birth anniversary, National Science Day, World Water Day and World Photography Day.

Women Cell:

Our Institute provides all the encouragement to women to excel in their field of expertise. A separate Cell is established in the institution to provide all the necessary encouragement to women to prove their capabilities and enhance them. The objective is to develop women students to self- motivated, self-esteemed and self-disciplined persons who can realize their aspirations and achieve their dreams.

Sexual Harassment Eradication Cell:

The institute protects the students and staff against sexual harassment through the Sexual Harassment Eradication Cell. This facility ensures security and confidence to everyone

Freshers' Day:

The college organizes Freshers' Day to welcome the Freshers. The Director, Dean and Department Heads grace the occasion. Second Year students organize cultural events and conduct competitions for newly joined students.

Annual Day:

The College celebrates its Annual Day in a grand manner. The Director presents the annual report of the college for the academic year. Academic prizes are awarded to the toppers in JNTU exams. Prizes are distributed to the winners in different activities like sports, cultural activities, games, extra-curricular and co-curricular events.

Graduation Day:

Sports Day:

Sports are an integral part of a student's life. A student must study hard to be successful in examinations as well as play sports to enjoy good health and vigor of life. The college organizes various outdoor events such as Cricket, Football, Volleyball, Throw ball, Tennikoit and Indoor events like Chess, Table Tennis, and Caroms on Sports Day to make students physically and mentally strong.

Alumni Day:

An institution's alumni are the reflection of its past, representation of its present and a link to its future. NNRG organizes Alumni Meet every year in the campus. The Alumni were invited and all the old students attend the gathering. The Alumni Association plays an important role in informing the current students about opportunities available in the industry.

Student Seminars:

The institute provides a great opportunity for the students to improve their skills within their curriculum. These seminars can improve students' language and encourage them to prepare and present seminars in all the subjects in the schedule given in the Time Table by using LCD Projectors.

Industrial Visits:

NNRESGI has active collaboration with several industries enabling regular industrial visits for all the students to keep them abreast with industry needs. Some of the visits organizedby the departments of the institute are-

- TCS
- Infosys
- Tech Mahindra
- Cloud4c
- RCL
- BHEL
- ECIL
- Astra Microwave Products Limited(AMPL)
- NRSA-ISRO
- Primary Radar and Sensory Radar Stations
- 400KV Sub Station & many more
- RTTC-BSNL
- Nuclear Fuel Complex
- Doordarshan Kendra
- Roshni Microsystems
- Mana TV
- Diesel Loco Shed
- Analogics Tech India Limited …..

Memorandum of Understanding (MOU)

NNRESGI has signed MOUs with various organizations and industries to train the students and to upgrade their technical skills, aptitude and overall personality development. This also helps the students to undergo internships, project works and get hands – on experience.

MOU's signed by NNRESGI:

- TASK
- Oracle Academy
- CYMAX
- IMFS
- VMware
- Vedic Systems

- CI smart connect technologies
- Astra Microwave Products Limited(AMPL)
- Digital lync

- Smart Infe – Est
- Ram Tech
- EAISEB
- Medha
- Axiom Energy Solutions
- Udai Engineering works
- H – Bots
- SRCNC Technology
- DEFW Automations
- GPR Electrical &Automation
- Siliconus……

Professional Societies/Student Chapters

Today's industries and organizations which provide career opportunities look for the following capabilities in students:

1. Latest knowledge in their respective and related fields
2. Communication skills, interactive skills and professional acquaintances
3. Technical writing skills

There are some societies related to each discipline/branch where students can become members, to achieve the capabilities mentioned above. These societies organize lectures, seminars, workshops, and conferences for students and professionals. They also publish magazines and journals with the latest discoveries, which they send to the students at their addresses as part of their membership package. These publications are monthly, quarterly, yearly and annual. It is beneficial for students to become members of these societies.

S. No.	Branch	Name of the Institution
1	CSE	1. Indian Society for Technical Education (ISTE) 2. Computer Society of India (CSI) 3. Institute of Electrical and Electronics Engineers (IEEE)
2	ECE	1. Institute of Electronics and Telecommunication Engineers (IETE) 2.Indian Society for Technical Education (ISTE) 3.Institute of Electrical and Electronics Engineers (IEEE)
3	EEE	1. Institute of Electrical and Electronics Engineers (IEEE) 2.Indian Society for Technical Education (ISTE) 3.Institute of Engineers(IE)
4	ME	1. Indian Society for Technical Education (ISTE) 2. American Society of Mechanical Engineers(ASME)
5	CE	1. Indian Society for Technical Education (ISTE) 2. Institute of Engineers (IE)

Programs as part of Corporate Social Responsibility (CSR) being conducted include:

- Blood Donation Camp
- Village Survey
- Free Medical Camp
- Hygiene & Cleanliness Awareness Program in nearby villages
- Save Water and Trees
- Tree Plantation
- Digital Literacy Program

NNRESGI-IEEE Women in Engineering:

NNRESGI's IEEE Women in Engineering (WIE) Group is the largest international professional organization dedicated to promoting women engineers and scientists. The mission of IEEE WIE is to facilitate the recruitment and retention of women in technical disciplines globally. Technical events, activities and conferences are conducted exclusively to enhance networking and to promote WIE's motto.

NCC Wing:

NCC at NNRESGI has been functioning extremely well since the inception of the institute with the constant and motivating support from the management. All the cadets have been selected based on their skills and ambition. The main aim of NCC is to cultivate Unity and Discipline. All the selected cadets are trained in various fields and they actively participate in social service.

NSS Wing:

NSS provides an excellent opportunity to the students who desire to serve the community and to develop interpersonal relationships and skills. They conduct Swacch Bharat (Clean & Green), tree planting campaigns, blood donation camps and free medical camps. First Aid awareness programmes and AIDS awareness programmes are also organized. Engaging in social activities to bridge the gap between the fortunate and the less fortunate and empowering them is the main focus of NSS activity.

Entrepreneurship Development Cell (EDC):

The Entrepreneurship Development Cell is established in the institution to organize Entrepreneurship Awareness Camps, Entrepreneurship Development Programmes and Faculty Development Programmes with the aim to encourage the students towards Entrepreneurship and to encourage faculty to be better prepared to train the students.

Industry Institute Interaction Cell (IIIC) & Institution's Innovation Council (IIC)

The Institute has placed emphasis on the cultivation of strong links with the industry to promote various industrial activities by the faculty members and students. In order to keep up with the growing volume of industrial liaison activities and even more importantly, to catalyze the further growth and development of interaction between the Institute and Industry, a separate cell (Industry-Institute Interaction Cell - IIIC) was established in the institution. IIIC coordinates with all the faculties of the University and Industry.

XIV. INDUCTION PROGRAMME:

NNRESGI organizes induction programme for the fresher's and their parents at the beginning of the first semester in order to familiarize them with the fundamentals of the institute. The Induction programme includes lectures by motivational speakers, writers, soft skills trainers, yoga and meditation trainers, language trainers and entrepreneurs of international repute. Another interesting feature of the Induction programme is the literary and cultural competitions for students to exhibit their creativity.

Induction is an extremely significant part of our students' lives here at NNRESGI as it is a major junction where we try to bridge the gap between school and college input on human values and ethics to equip them to be globally competent and ethically strong professionals.

XV. CONTACT INFORMATION

Website Address : http://www.nnrg.edu.in
E-mail : admin@nnrg.edu.in, director@nnrg.edu.in, tpo@nnrg.edu.in
Phone Numbers : 040-29705282, 9985311103, 9885294405, 8886531118
Fax : 040-29705284

For any administrative issues and information, please contact:

Designation	Name	Mobile No.
Administrative Officer	Mr. Anand Paul Meripo	9704820333
Admin In-charge for general problems and scholarship issues	Mr. E. Sampath Reddy	9885294408
Admin In-charge for general problems	Mr. N. Sreedhar Reddy	9885294405
Transport In-charge	Mr. T. Sai Bharath Reddy	9985311105

Designation	Name	Mobile No.
HOD, H&S	Dr. E. Chandra Shekar	9440605489
HOD, Civil	Dr. G. Subba Rao	9494413053
HOD, CSE	Dr. K. Rameshwaraiah	9553977907
HOD, ECE	Dr. B. Ravi	9030717749
HOD, CSM	Dr. G. Sravan Kumar	9441926953
HOD, CSD	Mrs. V. Indrani	9985385426
TPO	Mr. K. Sreekanth	9985930301
I/C of Examinations	Mr. P. S. Srinivasa Reddy	9493014534

*** Contact in case of urgency only**

XVI. COMMITTEES

The following Committees have been constituted to streamline the Administration of the Institution. These committees plan and execute various activities for smooth functioning and general development of the Institution.

- College Academic Committee
- Grievances And Redressal Committee
- Anti Sexual Harassment Committee/Women Empowerment Cell
- Anti Ragging Committee
- Disciplinary Committee
- Time Table Committee
- Placement Committee
- Alumni Committee
- Library Committee
- Arts/Cultural/Literary & Hobby Club Committee
- Sports & Games Committee
- Transport Committee
- Student Affairs Committee
- Quality Assurance Committee etc.

XVII. B.TECH. COURSE STRUCTURE

Electronics and Communication Engineering

I Year I Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	25MA101BS	Matrices and Calculus	3	1	0	4
2	25PH102BS	Advanced Engineering Physics	3	0	0	3
3	25ME103ES	Engineering Drawing and Computer Aided Drafting	2	0	2	3
4	25EN103HS	English for Skill Enhancement	3	0	0	3
5	25EC104ES	Introduction to Electrical Engineering	2	0	0	2
6	25CS105ES	Programming for Problem Solving	3	0	0	3
7	25PH106BS	Advanced Engineering Physics Lab	0	0	2	1
8	25CS107ES	Programming for Problem Solving Lab	0	0	2	1
9	25EN108HS	English Language and Communication Skills Laboratory	0	0	2	1
10		Induction Program				
		Total Credits	**16**	**01**	**08**	**21**

I Year II Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	25MA201BS	Ordinary Differential Equations and Vector Calculus	3	0	0	3
2	25CH202BS	Engineering Chemistry	3	0	0	3
3	25CS203ES	Python Programming	3	0	0	3
4	25EE204ES	Network Analysis and Synthesis	3	0	0	3
5	25CS205ES	Data Structures	3	0	0	3
6	25CH206BS	Engineering Chemistry Lab	0	0	2	1
7	25CS207ES	Data Structures Lab	0	0	2	1
8	25EC208ES	Applied Python Programming Lab	0	0	2	1
9	25ME209ES	Engineering Workshop	0	0	2	1
10	25EC210ES	Electrical Engineering Lab	0	0	2	1
		Total Credits	**15**	**0**	**10**	**20**

L: T: P: C (Lecture periods: Tutorial periods: Practical periods: Credits)

B.Tech. in COMPUTER SCIENCE AND ENGINEERING
Course Structure (R25 Regulations)

I Year I Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	25MA101BS	Matrices and Calculus	3	1	0	4
2	25CH102BS	Engineering Chemistry	3	0	0	3
3	25EN103HS	English for Skill Enhancement	3	0	0	3
4	25EC104ES	Electronic Devices and Circuits	3	0	0	3
5	25CS105ES	Programming for Problem Solving	3	0	0	3
6	25CH106BS	Engineering Chemistry Lab	0	0	2	1
7	25CS107ES	Programming for Problem Solving Lab	0	0	2	1
8	25EN108HS	English Language and Communication Skills Lab	0	0	2	1
9	25ME109ES	Engineering Workshop	0	0	2	1
10		Induction Program				
		Total Credits	**15**	**1**	**8**	**20**

I Year II Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	25MA201BS	Ordinary Differential Equations and Vector Calculus	3	0	0	3
2	25PH202BS	Advanced Engineering Physics	3	0	0	3
3	25ME203ES	Engineering Drawing and Computer Aided Drafting	2	0	2	3
4	25EE204ES	Basic Electrical Engineering	3	0	0	3
5	25CS205ES	Data Structures	3	0	0	3
6	25PH206BS	Advanced Engineering Physics Lab	0	0	2	1
7	25CS207ES	Data Structures Lab	0	0	2	1
8	25CS208ES	IT Workshop	0	0	2	1
9	25EE209ES	Basic Electrical Engineering Lab	0	0	2	1
10	25CS210ES	Python Programming Lab	0	0	2	1
		Total Credits	**14**	**0**	**12**	**20**

L: T: P: C (Lecture periods: Tutorial periods: Practical periods: Credits)

B.Tech. in CSE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)
Course Structure (R25 Regulations)

I Year I Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	25MA101BS	Matrices and Calculus	3	1	0	4
2	25PH102BS	Advanced Engineering Physics	3	0	0	3
3	25ME103ES	Engineering Drawing and Computer Aided Drafting	2	0	2	3
4	25EE104ES	Basic Electrical Engineering	3	0	0	3
5	25CS105ES	Programming for Problem Solving	3	0	0	3
6	25PH106BS	Advanced Engineering Physics Lab	0	0	2	1
7	25CS107ES	Programming for Problem Solving Lab	0	0	2	1
8	25EE109ES	Basic Electrical Engineering Lab	0	0	2	1
9	25CS108ES	IT Workshop	0	0	2	1
10		Induction Program				
		Total Credits	**14**	**1**	**10**	**20**

I Year II Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	25MA201BS	Ordinary Differential Equations and Vector Calculus	3	0	0	3
2	25CH202BS	Engineering Chemistry	3	0	0	3
3	25EC204ES	Electronic Devices and Circuits	3	0	0	3
4	25CS205ES	Data Structures	3	0	0	3
5	25EN203HS	English for Skill Enhancement	3	0	0	3
6	25CH206BS	Engineering Chemistry Lab	0	0	2	1
7	25CS207ES	Data Structures Lab	0	0	2	1
8	25EN208HS	English Language and Communication Skills Lab	0	0	2	1
9	25ME209ES	Engineering Workshop	0	0	2	1
10	25CS210ES	Python Programming Lab	0	0	2	1
		Total Credits	**15**	**0**	**10**	**20**

L: T: P: C (Lecture periods: Tutorial periods: Practical periods: Credits)

B.Tech. in CSE (DATA SCIENCE)
Course Structure (R25 Regulations)

I Year I Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	25MA101BS	Matrices and Calculus	3	1	0	4
2	25CH102BS	Engineering Chemistry	3	0	0	3
3	25EE104ES	Basic Electrical Engineering	3	0	0	3
4	25EC104ES	Electronic Devices and Circuits	3	0	0	3
5	25CS105ES	Programming for Problem Solving	3	0	0	3
6	25CH106BS	Engineering Chemistry Lab	0	0	2	1
7	25CS107ES	Programming for Problem Solving Lab	0	0	2	1
8	25EE109ES	Basic Electrical Engineering Lab	0	0	2	1
9	25ME109ES	Engineering Workshop	0	0	2	1
10		Induction Program				
		Total Credits	**15**	**1**	**8**	**20**

I Year II Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	25MA201BS	Ordinary Differential Equations and Vector Calculus	3	0	0	3
2	25PH202BS	Advanced Engineering Physics	3	0	0	3
3	25ME203ES	Engineering Drawing and Computer Aided Drafting	2	0	2	3
4	25EN203HS	English for Skill Enhancement	3	0	0	3
5	25CS205ES	Data Structures	3	0	0	3
6	25PH206BS	Advanced Engineering Physics Lab	0	0	2	1
7	25CS207ES	Data Structures Lab	0	0	2	1
8	25CS208ES	IT Workshop	0	0	2	1
9	25EN208HS	English Language and Communication Skills Lab	0	0	2	1
10	25CS210ES	Python Programming Lab	0	0	2	1
		Total Credits	**14**	**0**	**12**	**20**

L: T: P: C (Lecture periods: Tutorial periods: Practical periods: Credits)

B.Tech. in Civil Engineering
COURSE STRUCTURE (R25 Regulations)

I Year I Semester (25 Hours)

S. No.	Course Code	Course Title	L	T	P	Credits
1	25MA101BS	Matrices and Calculus	3	1	0	4
2	25PH102BS	Advanced Engineering Physics	3	0	0	3
3	25ME103ES	Engineering Drawing and Computer Aided Drafting	2	0	2	3
4	25EE105ES	Elements of Electrical and Electronics Engineering	3	0	0	3
5	25CS105ES	Programming for Problem Solving	3	0	0	3
6	25PH106BS	Advanced Engineering Physics Lab	0	0	2	1
7	25CS107ES	Programming for Problem Solving Lab	0	0	2	1
8	25EE108ES	Elements of Electrical and Electronics Engineering Lab	0	0	2	1
9	25ME109ES	Engineering Workshop	0	0	2	1
10		Induction Program				
		Total Credits	**14**	**01**	**10**	**20**

I Year II Semester (26 Hours)

S. No.	Course Code	Course Title	L	T	P	Credits
1	25MA201BS	Ordinary Differential Equations and Vector Calculus	3	0	0	3
2	25CH202BS	Engineering Chemistry	3	0	0	3
3	25CS203ES	Python Programming	3	0	0	3
4	25EN203HS	English for Skill Enhancement	3	0	0	3
5	25CE204PC	Building Planning and Construction	3	0	0	3
6	25CE205PC	Engineering Mechanics for Civil Engineers	3	0	0	3
7	25CH206BS	Engineering Chemistry Lab	0	0	2	1
8	25CS210ES	Python Programming Lab	0	0	2	1
9	25EN208HS	English Language and Communication Skills Lab	0	0	2	1
10		NSS and Yoga			2	
		Total Credits	**18**	**0**	**08**	**21**

L: T: P: C (Lecture periods: Tutorial periods: Practical periods: Credits)

MATRICES AND CALCULUS

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn

- Applying basic operations on matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form
- Geometrical approach to the mean value theorems and their application to the mathematicalproblems
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications

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

- Write the matrix representation of a set of linear equations and to analyze the solution of thesystem of equations
- Find the Eigen values and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Solve the applications on the mean value theorems.
- Find the extreme values of functions of two variables with/ without constraints.
- Evaluate the multiple integrals and apply the concept to find areas, volumes

UNIT-I: Matrices **8 L**

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations, Gauss Jacobi, Gauss Seidel Iteration Method.

UNIT-II: Eigen values and Eigen vectors **10 L**

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

UNIT-III: Single Variable Calculus **10 L**

Limit and continuity of functions and its properties. Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series (without proofs).

UNIT-IV: Multivariable Calculus (Partial Differentiation and applications) **10L**

Definitions of Limit and continuity.

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

UNIT-V: Multivariable Calculus (Integration) 10 L

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Change of variables for double (Cartesian to polar) and Evaluation of Triple Integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint,2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and CompanyLimited, New Delhi.

ASSIGNMENT QUESTIONS

UNIT-I

Short Answer Questions (1M):-

1) Define rank of a matrix.
2) Find the value of k such that rank of $\begin{bmatrix}1 & 2 & 3\\ 2 & K & 7\\ 3 & 6 & 10\end{bmatrix}$ is '2'.
3) State the conditions when the system of non-homogeneous equations $AX = B$ will have (i) Unique solution (ii) infinite no. of solutions (iii) no solution.
4) State the conditions when the system of homogeneous equations $AX = 0$ will have (i) trivial solution (ii) non trivial solutions.
5) Show that the vectors X_1=(1,1,1) X_2=(3,1,2) and X_3=(2,1,4) are linearly independent.
6) Show that the vectors X_1=(3,1,-4) X_2=(2,2,-3) and X_3=(0,-4,1) are linearly dependent.
7) Find the rank of $\begin{bmatrix}1 & 2 & 1\\ -2 & 4 & 3\\ 1 & 0 & 2\end{bmatrix}$.
8) Define Linearly Independent and Linearly Dependent set of vectors .
9) Define Homogeneous equation with an example.
10) Define Non Homogeneous equation with an example

Long Answer Questions:- (5M or 10M)

1) Find the Rank of the matrix by reducing into Echelon Form

(i) $\begin{bmatrix}0 & 1 & -3 & -1\\ 1 & 0 & 1 & 1\\ 3 & 1 & 0 & 2\\ 1 & 1 & -2 & 0\end{bmatrix}$ (ii) $\begin{bmatrix}2 & -4 & 3 & -1 & 0\\ 1 & -2 & -1 & -4 & 2\\ 0 & 1 & -1 & 3 & 1\\ 4 & -7 & 4 & -4 & 5\end{bmatrix}$

2) Find the Rank of the matrix by reducing $\begin{bmatrix}2 & 3 & -1 & -1\\ 1 & -1 & -2 & -4\\ 3 & 1 & 3 & -2\\ 6 & 3 & 0 & -7\end{bmatrix}$ into Normal form

3) Find the Rank of the matrix by reducing $\begin{bmatrix}-1 & -3 & 3 & -1\\ 1 & 1 & -1 & 0\\ 2 & -5 & 2 & -3\\ -1 & 1 & 0 & 1\end{bmatrix}$ into Normal form

4) Find the inverse of the matrix A= $\begin{bmatrix}1 & 6 & 4\\ 0 & 2 & 3\\ 0 & 1 & 2\end{bmatrix}$ by using Gauss-Jordan method

5) For what values of λ and μ the system of equations

$x+y+z=6, x+2y+3z=10, x+2y+\lambda z=\mu$ have
i) no solution ii) a unique solution iii) an infinite number of solutions.

6) Test for consistency and hence solve the system : $2x-y-z=2, x+2y+z=2, 4x-7y-5z=2$

7) Show that the only real number λ for which the system $x+2y+3z=\lambda x, 3x+y+2z=\lambda y, 2x+3y+z=\lambda z$ has non-zero solution is 6 and solve them, when $\lambda=6$

8) Solve the following system of equations $x+y-3z+2w=0, 2x-y+2z-3w=0, 3x-2y+z-4w=0, -4x+y-3z+w=0$

9) Solve the following system using Gauss Jacobi method

$$20x+y-2z=17,\ 3x+20y-z=-18,\ 2x-3y+20z=25$$

10) Solve the following system using Gauss Jacobi method.

$$8x-3y+2z=20,\ 4x+11y-z=33,\ 6x+3y+12z=35.$$

11) Solve the following system of equations using Gauss-Seidel iteration method.
$10x+y+z=12, 2x+10y+z=13, 2x+2y+10z=14$.

12) Solve the following system of equations using Gauss-Seidel iteration method.
$8x-3y+2z=20, 4x+11y-z=33, 6x+3y+12z=36$.

UNIT-II

Short Answer Questions (1M):-

1) Define Eigen value and Eigen Vector of a matrix.
2) If the Eigen values of A are 1,2,3 then find (i) det A (ii) Trace of A
3) Find the Eigen values of the matrix A^2 $\begin{bmatrix}1&0&0\\0&4&0\\0&0&3\end{bmatrix}$
4) State Cayley- Hamilton theorem.
5) Find the sum and product of the Eigen values of $\begin{bmatrix}1&1&3\\1&5&3\\3&1&1\end{bmatrix}$
6) Define Quadratic form.
7) Define Nature of a Quadratic form.
8) Define Rank, Index and signature of Quadratic form.
9) Find the symmetric matrix of the quadratic form $x^2-2y^2+z^2+2xy+8xz+2yz$
10) Write the quadratic form for the symmetric matrix $\begin{bmatrix}1&3\\3&5\end{bmatrix}$

Long Answer Questions (10M):-

1) Find the Eigen values and the corresponding Eigen vectors of the matrix A= $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$

2) Find the Eigen values and the corresponding Eigen vectors of the matrix A= $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$

3) Find the Eigen values and the Eigen vectors of $\begin{bmatrix} 1 & 2 & 2 \\ 0 & 2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$

4) Verify Cayley-Hamilton theorem for A= $\begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$

5) Verify Cayley-Hamilton theorem and hence find $A^{-1} and A^4$ for A= $\begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$

6) Verify Cayley-Hamilton theorem and hence find A^{-1} for A= $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$

7) i) If A= $\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ write $2A^5 - 3A^4 + A^2 - 4I$ as a linear polynomial in A.

ii) If A= $\begin{bmatrix} 1 & 2 & -3 \\ 0 & 3 & 5 \\ 0 & 0 & -2 \end{bmatrix}$, Find the Eigen values of A^3 + 5A +8I.

8) Reduce the quadratic form $3x^2 + 5y^2 + 3z^2 - 2xy + 2xz - 2yz$ to canonical form by Orthogonal transformation and hence discuss the nature, rank, index and signature of the quadratic form.

9) Reduce the quadratic $3x^2 - 2y^2 - z^2 - 4xy + 8xz + 12yz$ to canonical form and hence find nature of the quadratic form, index and signature of the quadratic form.

10) Reduce the quadratic form $2x^2 + 2y^2 + 2z^2 - 2xy + 2xz - 2yz$ to canonical form by Orthogonal transformation and hence discuss the nature, rank, index and signature of the quadratic form.

UNIT-III: CALCULUS

Short Answer Questions (1M):-

1. State Rolle's Theorem.
2. Verify whether Rolle's Theorem can be applied to $f(x) = \tan x$ in $[0, \pi]$
3. State Lagrange's Mean value theorem.
4. State Cauchy's Mean value theorem.
5. Define limit of a function.
6. Define continuity of a function.
7. State Taylor's Theorem with Lagrange's form of remainder.
8. Write the Maclaurin's series.
9. Find the value of 'c' using Rolle's mean value theorem for f(x)= x^2 in [-1,1]
10. Discuss the applicability of Lagrange's mean value theorem to the function f(x)=$\frac{1}{x}$ in [-1,1]
11. Verify Cauchy's mean value theorem for f(x)=sin x and g(x)=cos x on [0,$\frac{\pi}{2}$].

Long Answer Questions:-

1. Verify the Rolle's Theorem for the function $f(x) = \dfrac{\sin x}{e^x}$ in $(0, \pi)$.

2. Verify Rolle's Theorem for the function $f(x) = \log\left[\dfrac{x^2 + ab}{x(a+b)}\right]$ in [a, b].

3. Show that $\dfrac{\pi}{3} - \dfrac{1}{5\sqrt{3}} > \cos^{-1}\dfrac{3}{5} > \dfrac{\pi}{3} - \dfrac{1}{8}$ using Lagrange's mean value theorem.

4. If a<b, Prove that $\frac{b-a}{1+b^2} < \tan^{-1} b - \tan^{-1} a < \frac{b-a}{1+a^2}$ using Lagrange's mean value theorem and hence deduce that $\dfrac{\pi}{4} + \dfrac{3}{25} < \tan^{-1}\dfrac{4}{3} < \dfrac{\pi}{4} + \dfrac{1}{6}$.

5. Verify Cauchy's mean value theorem for the function e^x and e^{-x} in the Interval [a, b].

6. Discuss the applicability of Rolle's theorem for f(x)=|x| in [-1,1].

7. Verify Rolle's Theorem for the function f(x)=log[$\frac{x^2+ab}{x(a+b)}$]in [a.b], a>0,b>0.

8. Verify Lagrange's Mean value theorem for the function f(x)=x(x-1)(x-2) in[0,$\frac{1}{2}$].

9. Using Lagrange's Mean value theorem ,prove that $\frac{\pi}{3} - \frac{1}{5\sqrt{3}} > \cos^{-1}\frac{3}{5} > \frac{\pi}{3} - \frac{1}{8}$.

10. Verify Cauchy's mean value theorem for the function for the functions f(x)=x^2 and g(x)=x^3 in [1,2].

11. Verify Cauchy's mean value theorem for f(x)=sinx and g(x)=cosx on[0,$\frac{\pi}{2}$]

12. Verify Taylor's Theorem for $f(x) = x^3 - 3x^2 + 2x$ in $[0,\frac{1}{2}]$

UNIT-IV
PARTIAL DIFFERENTIATION AND APPLICATIONS

Short Answer Questions (1M):-

1. Write properties of Jacobian.
2. Define homogeneous function and give an example
3. Verify if $\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$ if $f(x,y) = x^3 + y^3 - 3axy$
4. State Euler's theorem for function of two variables**.**
5. Verify Euler's theorem for $z = ax^2 + 2hxy + by^2$
6. u = x^2+y^2, x=at^2, y=2at then find $\frac{du}{dt}$.
7. $If\ u = f(x+y, x-y)$, then find $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y}$
8. If *x=u (1+v), y=v (1+u)* then prove that $\frac{\partial(x,y)}{\partial(u,v)}$ *=1+u+v.*
9. If f(x, y) = xy+(x-y) then find the stationary points.
10. Define maximum and minimum of f(x, y)
11. What do you mean by saddle point?

Long Answer Questions:-

1. If $r^2 = x^2 + y^2 + z^2$ *and* $u = r^m$ *then prove that* $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} = m(m+1)r^{m-2}$.
2. $f\ u = f(y-z, z-x, x-y)$, then show that$\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.
3. If x + y + z = u, y + z = uv, z = uvw, then evaluate $\frac{\partial(x,y,z)}{\partial(u,v,w)}$
4. If $u = \log(\frac{x^2+y^2}{x+y})$ then prove that $xu_x + yu_y = 1$.
5. If $x = rcos\theta, y = rsin\theta\ find\ \frac{\partial(x,y)}{\partial(r,\theta)}\ and\ \frac{\partial(r,\theta)}{\partial(x,y)}$. Also show that $\frac{\partial(x,y)}{\partial(r,\theta)} . \frac{\partial(r,\theta)}{\partial(x,y)} = 1$
6. Show that functions u =xy + yz + zx, v= $x^2 + y^2 + z^2$ and w=x + y + z are functionally related. Find the relation between them.
7. If $u = x + y - z, v = x - y + z, w = x^2+y^2+z^2 - 2yz$ then show that the functions are functionally dependent Find the relation between them.
8. Find the relative maximum and minimum values of the function $f(x,y) = 3x^2y + y^3 - 3x^2 - 3y^2 + 1$
9. Examine for minimum and maximum values of sinx + siny + sin(x+y).
10. The temperature T at any point (x, y, z) in space is $T=400xyz^2$ Find the highest temperature on the surface of the unit sphere $x^2+y^2+z^2=1$.
11. A rectangular box open at the top is to have volume of 32cubic ft. Find the dimensions of the box requiring least material for its construction.
12. Find the maximum of $x^2+y^2+z^2$ such that 2x+3y+z=14 using Lagrange's multiplier method.

UNIT-V
MULTIPLE INTEGRALS (IMP.QUESTIONS)

Short Answer Questions (1M):-

1. Find the area bounded by the curves $y = x$ and $y = x^2$.
2. Evaluate $\int_0^1 \int_0^1 x^2\, y^2 dxdy$
3. Evaluate $\int_{-1}^1 \int_{-2}^2 \int_{-3}^3 d\, xdydz$.
4. Evaluate $\int_0^1 \int_0^{\sqrt{x}} d\, ydx$
5. Find the limits after changing the order of integration $\int_0^b \int_0^{\frac{a}{b}\sqrt{b^2-y^2}} f\,(x,y)dxdy$.
6. Show that area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$is $\frac{16a^2}{3}$.
7. Evaluate $\int_1^2 \int_0^x y^2\, dxdy$.
8. Evaluate $\int_{\theta=0}^{\pi} \int_{r=0}^{acos\theta} d\, rd\theta$.
9. Evaluate $\int_0^1 \int_0^{\sqrt{1+x^2}} \frac{dxdy}{1+x^2+y^2}$.
10. $\int_0^1 \int_1^2 \int_2^3 xyz\, dx\, dy\, dz$.

Long Answer Questions:-

1. Evaluate $\int_0^{\pi} \int_0^{a(1+cos\theta)} r^2\, cos\theta\, drd\theta$.
2. Evaluate $\iint_R x\, y\, dxdy$ where R is the region bounded by $x - axis$ ordinate $x = 2a$ and the curve $x^2 = 4ay$
3. Change into polar co-ordinates and evaluate $\int_0^{\infty} \int_0^{\infty} e^{-(x^2+y^2)}\, dxdy$.
4. By changing into polar coordinates, evaluate $\iint \frac{x^2y^2}{x^2+y^2}\, dxdy$ over the annular region between the circles $x^2 + y^2 = a^2$ and $x^2 + y^2 = b^2$
5. Evaluate $\iint r^3\, drd\theta$ over the area included beyween the circles $r = 2sin\theta$ and $r = 4sin\theta$
6. Change the order of integration in $\int_0^1 \int_{x^2}^{2-x} x\, y\, dxdy$ and hence evaluate the double integral.
7. Change the order of integration and evaluate $\int_0^{4a} \int_{x^2/4a}^{2\sqrt{ax}} dydx.$
8. Change the order of integration and evaluate $\int_0^{a} \int_{x/a}^{\sqrt{x/a}} (x^2 + y^2)dxdy.$
9. Evaluate $\int_0^1 \int_0^{1-z} \int_0^{1-y-z} x\, yz\, dxdydz$
10. Evaluate $\int_0^{log2} \int_0^x \int_0^{x+logy} e^{x+y+z}\, dx\, dy\, dz$

11. Find the volume of the tetrahedron bounded by the planes x=0, y=0, z=0 and $\frac{x}{a}+\frac{y}{b}+\frac{z}{c}$=1.

12. Find the area of the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$.

13. Find the area of the circle using double integral.

ENGINEERING CHEMISTRY

Course Objectives:

1. To develop adaptability to new advances in Engineering Chemistry and acquire the essential skills to become a competent engineering professional.
2. To understand the industrial significance of water treatment, fundamental principles of battery chemistry, and the impact of corrosion along with its control methods for structural protection.
3. To impart foundational knowledge of various energy sources and their practical applications in engineering.
4. To equip students with an understanding of smart materials, biosensors, and analytical techniques applicable in engineering, industrial, environmental, and biomedical fields.

Course Outcomes:

1. Students will be able to understand the fundamental properties of water and its applications in both domestic and industrial purposes.
2. Students will gain basic knowledge of electrochemical processes and their relevance to corrosion and its control methods.
3. Students will comprehend the significance and practical applications of batteries and various energy sources, enhancing their potential as future engineers and entrepreneurs.
4. Students will learn the basic concepts and properties of polymers and other engineering materials.
5. Students will be able to apply the principles of UV-Visible, IR spectroscopy and Raman spectroscopy in analyzing pollutants in dye industries and biomedical applications.

UNIT - I: Water and its treatment: [10]

Introduction- Hardness, types, degree of hardness and units. Estimation of hardness of water by complexometric method - Numerical problems. Potable water and its specifications (WHO) - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break- point chlorination. Defluoridation - Nalgonda technique.

Boiler troubles: Scales, Sludges and Caustic embrittlement. Internal treatment of boiler feed water - Calgon conditioning, Phosphate conditioning, Colloidal conditioning. External treatment methods - Softening of water by ion- exchange processes. Desalination of brackish water — Reverse osmosis.

UNIT - II: Electrochemistry and Corrosion: [10]

Introduction- Electrode potential, standard electrode potential, Nernst equation (no derivation), electrochemical cell - Galvanic cell, cell representation, EMF of cell - Numerical problems. Types of electrodes, reference electrodes - Primary reference electrode - Standard Hydrogen Electrode (SHE), Secondary reference electrode - Calomel electrode. Construction, working and determination of pH of unknown solution using SHE and Calomel electrode.

Corrosion: Introduction- Definition, causes and effects of corrosion — Theories of corrosion, chemical and electrochemical theories of corrosion, Types of corrosion: galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion - Nature of the metal, Nature of the corroding environment. Corrosion control methods - Cathodic protection Methods - Sacrificial anode and impressed current methods.

UNIT - III: Energy sources: [10]

Batteries: Introduction — Classification of batteries - Primary, secondary and reserve batteries with examples. Construction, working and applications of Zn-air and Lithium ion battery. Fuel Cells — Differences between a battery and a fuel cell, Construction and applications of Direct Methanol Fuel Cell (DMFC).

Fuels: Introduction and characteristics of a good fuel, Calorific value — Units - HCV, LCV- Dulongs formula - Numerical problems.

Fossil fuels: Introduction, Classification, Petroleum - Refining of Crude oil, Cracking - Types of cracking - Moving bed catalytic cracking. LPG and CNG composition and uses.

Synthetic Fuels: Fischer-Tropsch process, Introduction and applications of Hythane and Green Hydrogen.

UNIT - IV: Polymers: [10]

Definition - Classification of polymers: Based on origin and tacticity with examples — Types of polymerization - Addition (free radical addition mechanism) and condensation polymerization.

Plastics, Elastomers and Fibers: Definition and applications (PVC, Buna-S, Nylon-6,6). Differences between themoplastics and thermo setting plastics, Fiber reinforced plastics (FRP).

Conducting polymers: Definition and Classification with examples - Mechanism of conduction in trans- poly-acetylene and applications of conducting polymers.

Biodegradable polymers: Polylactic acid and its applications.

UNIT - V: Advanced Functional Materials: [10]

Smart materials: Introduction, Classification with examples - Shape Memory Alloys — Nitinol, Piezoelectric materials – quartz and their engineering applications.

Biosensor - Definition, Amperometric Glucose monitor sensor.

Interpretative spectroscopic applications of UV-Visible spectroscopy for Analysis of pollutants in dye industry, IR spectroscopy in night vision-security, Pollution Under Control- CO sensor (Passive Infrared detection), Raman spectroscopy (application) - Tumour detection in medical applications.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010.
2. Engineering Chemistry by Rama Devi, Dr. P. Aparna and Rath, Cengage learning, 2025.

REFERENCE BOOKS:

1.Engineering Chemistry: by Thirumala Chary Laxminarayana & Shashikala, Pearson Publications (2020)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi 2011.
3. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi 2015.
4. Engineering Analysis of Smart Material Systems by Donald J. Leo, Wiley, 2007.
5. Challenges and Opportunities in Green Hydrogen by Editors: Paramvir Singh, Avinash Kumar Agarwal, Anupma Thakur, R.K Sinha.
6. Raman Spectroscopy in Human Health and Biomedicine, https://www.worldscientific.com/doi/epdf/10.1142/13094
7. E-Content- https://doi.org/10.1142/13094 | October 2023
8.E-books: ttps://archive.org/details/EngineeringChemistryByShashiChawla/page/n11/mode/2u

ASSIGNMENT QUESTIONS

UNIT- I: WATER AND ITS TREATMENT

Long answer questions:

1. What are the types of hardness of water? What are the units of hardness and write the interconversion between various units of hardness.
2. Explain the estimation of hardness of water by EDTA complexometric method.
3. What is potable water? List out its specifications and explain the various steps involved in the treatment of potable water
4. Explain defluoridation of water by Nalgonda Technique
5. Numerical Problem on Degree of Hardness of water.
6. Numerical Problem on EDTA method.
7. Explain causes, effects and prevention of Caustic embrittlement.
8. Discuss Reverse Osmosis method for the desalination of brackish water with the help of a neat diagram.
9. Discuss Ion Exchange process for softening of hard water with the help of a neat diagram.
10. Explain internal treatment of water with equations.
11. Differentiate Scales & Sludges.
12. Explain the principle in the estimation of hardness of water.

UNIT-II ELECTROCHEMISTRY & CORROSION:

Long answer questions:

1. Explain the construction and working of galvanic Cell.
2. Explain the construction, working of Standard Hydrogen electrode(SHE)
3. Explain the construction and working standard calomel electrode
4. Explain the mechanism of electrochemical theory of wet corrosion by taking iron as an example.
5. Explain Cathodic Protection.
6. Explain how metal and environment affect the rate of corrosion.
7. Explain the determination of PH of unknown solution using calomel electrode and SHE.
8. a) Define single electrode potential, standard electrode potential, Emf, reference electrode & indicator electrode.
9. Explain the various types of corrosion.
10. Explain dry theory of corrosion.
11. Numericals on emf.
12. Explain Oxidation corrosion.

UNIT-III ENERGY SOURCES:

Long answer questions:

1. Explain the construction, working and applications of Lithium ion battery
2. Explain the construction, working and applications of DMFC

3. List out the characteristics of a good fuel.
4. Explain synthesis of petrol by Fischer-Tropsch's process.
5. Explain moving bed catalytic cracking.
6. Explain the refining of petroleum by fractional distillation.?
7. Explain Hythane and green hydrogen.
8. Differentiate primary and secondary battery.
9. Define Calorific value of a fuel, write its units. What are various types of calorific value?
10. Write the composition and applications of CNG & LPG.
11. Numericals on Dulong formula.
12. Distinguish battery and fuel cell

UNIT-IV POLYMERS:

Long answer questions:

1. What are polymers? Give the classification of polymers with examples.
2. Explain the mechanism of free radical addition polymerization with an example.
3. Write an account on preparation, properties and uses of Buna-S rubber, PVC.
4. Distinguish between thermoplastic and thermosetting plastics.
5. What are conducting polymers? Explain the mechanism of conduction in trans-polyacetylene.
6. What are Biodegradable polymers? Explain the synthesis, properties and applications of Polylactic acid.
7. Write the differences between addition and condensation polymerisation.
8. Write an account on preparation, properties and uses of Nylon-6,6.
9. Write the classification of conducting polymers.
10. Differentiate plastics, fibres and elastomers. Give examples.
11. What are fibre reinforced plastics? List out their applications.
12. Define Functionality and tacticity of the polymer.

UNIT-V ADVANCED FUNCTIONAL MATERIALS:

Long Answer Questions:

1. Explain the properties and classification of smart materials with suitable examples along with their engineering applications.
2. Write short notes about shape memory alloys with examples and applications.
3. Discuss piezoelectric materials and their engineering applications.
4. Explain the principle, working and applications of biosensors in medical and other related fields.
5. Discuss the spectroscopic applications of UV-visible spectrum for analysis of pollutants in dye industry.
6. Explain the role of IR spectroscopy in night vision security & CO sensors.
7. Write a note on Raman spectroscopy in tumour detection and its medical applications.
8. Explain the principle of UV-visible spectroscopy. Define Beer-Lambert's law.
9. Describe the principle of passive infrared detection or pollution under control CO sensor.
10. Write the principle in Raman Spectroscopy.
11. Define piezoelectric effect. What are the applications of Nitinol & Quartz.
12. Mention the types of CO sensors.

PROGRAMMING FOR PROBLEM SOLVING

Course Objectives:
1. To learn the fundamentals of computers.
2. To understand the various steps in program development.
3. To learn the syntax and semantics of the C programming language.
4. To learn the usage of structured programming approaches in solving problems.

Course Outcomes: The student will learn
1. To write algorithms and to draw flowcharts for solving problems.
2. To convert the algorithms/flowcharts to C programs.
3. To code and test a given logic in the C programming language.
4. To decompose a problem into functions and to develop modular reusable code.
5. To use arrays, pointers, strings and structures to write C programs.
6. Searching and sorting problems.

UNIT - I: Overview of C:C Language Elements, Variable Declarations and Data Types, Executable Statements, General Form of a C Program, Operators, expressions and precedence, Formatting Numbers in Program Output.
Selection Structures: Control Structures, Conditions, if Statement, if Statements with Compound Statements, Decision Steps in Algorithms.
Repetition and Loop Statements: Repetition in Programs, Counting Loops and the while Statement, Computing a Sum or Product in a Loop, for Statement, Conditional Loops, Loop Design, Nested Loops, do-while Statement.

UNIT - II: Top-Down Design with Functions: Building Programs from Existing Information, Library Functions, Top-Down Design and Structure Charts, Functions without Arguments, Functions with Input Arguments.
Pointers and Modular Programming: Pointers and the Indirection Operator, Functions with Output Parameters, Multiple Calls to a Function with Input/ Output Parameters, Scope of Names, Formal Output Parameters as Actual Arguments.

UNIT - III: Arrays: Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Using Array Elements as Function Arguments, Array Arguments, Searching and Sorting an Array, Parallel Arrays and Enumerated Types, Multidimensional Arrays.
Strings: String Basics, String Library Functions: Assignment and Substrings, Longer Strings: Concatenation and Whole-Line Input, String Comparison, Arrays of Pointers.

UNIT - IV: Recursion: The Nature of Recursion, Tracing a Recursive Function, Recursive Mathematical Functions, Recursive Functions with Array and String Parameters
Structure and Union Types: User-Defined Structure Types, Structure Type Data as Input and Output Parameters, Functions with Structured Result Values, Union Types.

UNIT - V: Text and Binary File Pointers: Input/ Output Files - Review and Further Study, Binary Files, Searching a Database. Searching and Sorting: Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms).

TEXT BOOKS:

1. Jeri R. Hanly and Elliot B. Koffman, Problem solving and Program Design in C 7th Edition, Pearson.
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill.
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB.
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition.

ASSIGNMENT QUESTIONS

Unit - 1

1. Define an Algorithm and State Properties of it? Write an algorithm for the roots of Quadratic Equation?
2. Define a Flowchart and explain different symbols used for flowchart? Draw the flowchart to find whether a number is prime or not.
3. Explain a general structure of C program with an example?
4. Explain different types of data types supported in C language?
5. What is an operator? Explain in detail various operators in c.
6. What is Expression? Explain in detail about Expression evaluation with Associativity & Precedence?
7. Explain the types of type conversions in C with example?
8. What are different types of ' if ' statements available in c? Explain them with examples?
9. Elaborate Switch statement with example program.
10. Write in detail about different types of loop statements in C.
11. Show how break and continue statements are used in a c programming with example.
12. Write a C program to check whether the given number is Prime Number or not?
13. Write a C program to check whether the given number is Palindrome or not?
14. Write a C program to print all Prime Numbers between 1 & N?
15. Write a C program to generate N terms of Fibonacci sequence?

Unit - 2

1. What is a function? Why we use functions in C language? Give an example.
2. Distinguish between Library functions and User defined functions in C and Explain withexamples.
3. What is Proto Type of function? What are the three main parts of a function in C? Explain each briefly with syntax.
4. Explain different types of C functions based on the return values and arguments.
5. Explain the Parameter Passing Mechanisms in C-Language with examples.
6. Distinguish actual parameters and formal parameters.
7. Give a scope and life time of the following a) static variable b) extern variable.
8. Explain briefly about different types of storage classes in C with an example program.
9. Define Pointer? Explain the process of declaring and initializing pointers with example.
10. Explain how pointers are used as function arguments with suitable program? Write a C function using pointers toexchange the values stored in two locations in the memory

Unit - 3

1. What is an array? Explain different types of arrays with an example each?
2. How can we pass the Whole Array to Functions? Explain with example program.
3. Define C string? How to declare and initialize C strings with an example?
4. Explain about String handling functions with example programs.
5. How can we declare and initialize Array of strings in C ? Write a program to read and display array of strings.
6. Write Short notes on enumeration data type.
7. Write a C Program to perform Addition of two matrices?
8. Write a C Program to perform Multiplication of two matrices?
9. Write a C Program to perform Transpose of matrix?
10. Write a C Program to find maximum, minimum & average of array of integers?
11. Write a C program to access a one dimensional array using pointers?

Unit - 4

1. What is recursive function? What are the limitations of recursion?
2. Write a c program to find factorial of a given number using recursion?
3. Explain about dynamic memory management functions with an example.
4. Explain a structure in detail with example?
5. Explain in detail of array of structure with example?
6. Explain in detail about pointers to structure with an example.
7. Explain unions in C language? Differentiate structures and unions.

8. Write C programs that use both recursive and non-recursive functions
   - To find the factorial of a given integer.
   - To print Fibonacci sequence
   - To find the GCD (greatest common divisor) of two given integers.
   - To find x^n

9. Define a structure type book that would contain book name, author, pages and price. Write a program to read this data using member operator and display the same.
10. Write a C program using array of structure to create employee records with the following fields: emp-id, name, designation, address, salary and display it.

Unit - 5

1. Define file? Explain about the types of files with examples.
2. Explain different modes of opening files with syntax and example?
3. Explain about random access to files with example?
4. Write a program to read five student information into a file. The student information must consists of student name, roll number, branch and section
5. Write a C program to copy one file to another file.
6. Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).
7. Write a C program to count the lines, words and characters in a given text.
8. What is meant by searching? Explain the linear search algorithm with example program?
9. Explain the Binary search algorithm with example? Write a C program to implement Binary Search Algorithm
10. Explain the Bubble Sort Algorithm with an example and write a C Program to implement Bubble Sort Algorithm.
11. Explain the Selection Sort Algorithm with an example and write a C Program to implement Selection Sort Algorithm.
12. Explain the Insertion Sort Algorithm with an example and write a C Program to implement Insertion Sort Algorithm.

BASIC ELECTRICAL ENGINEERING

Course Objectives:

- To understand DC and Single & Three phase AC circuits
- To study and understand the different types of DC, AC machines and Transformers.
- To import the knowledge of various electrical installations and the concept of power, power factor and its improvement.

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

CO1: Understand and analyze basic Electrical circuits
CO2: Study the working principles of Electrical Machines and Transformers
CO3: Introduce components of Low Voltage Electrical Installations.

UNIT-I:

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL & KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT-II:

A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III:

Transformers: Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV:

Electrical Machines: Construction and working principle of dc machine, performance characteristics of dc shunt machine. Generation of rotating magnetic field, Construction and working of a three-phase induction motor, Significance of torque-slip characteristics. Single-phase induction motor, Construction and working. Construction and working of synchronous generator.

UNIT-V:

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2nd Edition, 2008.

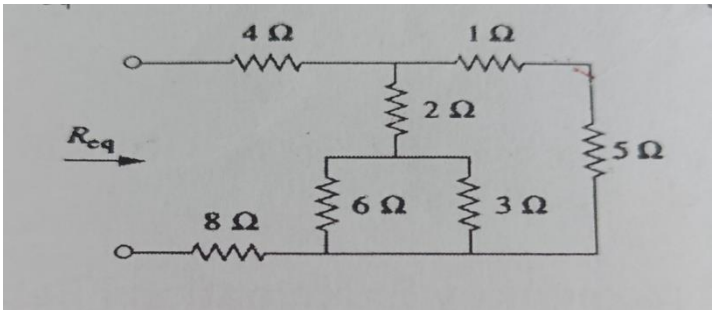
REFERENCE BOOKS:

1. P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, "Basic Electrical Engineering", S. Chand, 2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

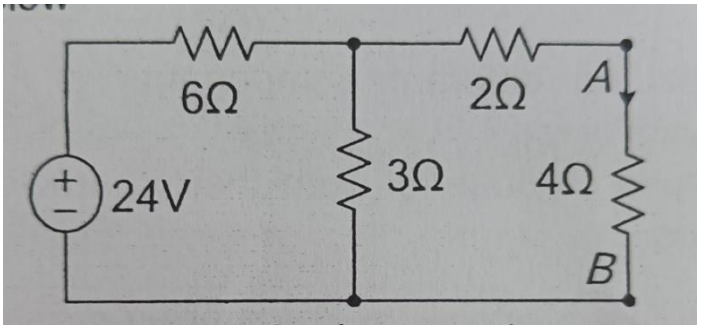
ASSIGNMENT QUESTIONS

UNIT-1 (DC circuits)

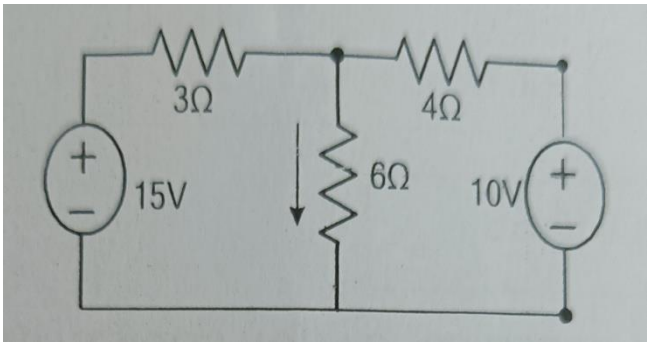
1. Explain the classification of various circuit elements.
2. Explain in detail on various types of voltage and current soures.
3. Explain the KCL and KVL with examples.
4. Explain V-I relation in R, L and C elements.
5. Find the R_{eq} for the circuit shown in below figure



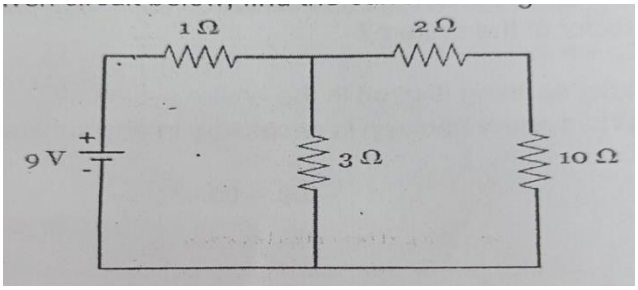
6. State Norton's Theorem, Thevenin's theorem, Superposition theorem
7. Using the Thevenins theorem, determine the current through the 4 Ohms resistor as shown in figure below



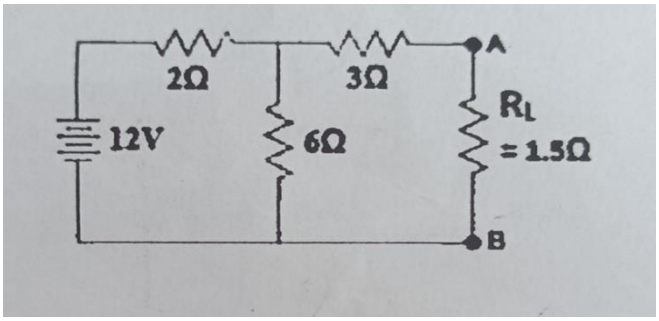
8. Using the Superposition theorem, determine the current through the 6 Ohms resistor as shown in figure below



9. For the given circuit below, find the current through 10 Ohms resistor?



10. Find the current through the resistance R_L(1.5 Ohms) of the circuit shown in the figure below using Norton's equivalent circuit



11. Derive the expression for transient current in R-C circuit.
12. A series R-L circuit is supplied by the voltage. Determine the expression for i(t) when the switch is closed at t=0.

Unit-2 (AC circuits)

1. Define the following terms
   i. Frequency
   ii. Peak factor
   iii. Form factor
   iv. Average value
   v. RMS value
   vi. Instantaneous value of an alternating quantity
2. Derive an expression for Average value and RMS value of an alternating current wave $I=I_m \sin\omega t$.

3. The below table gives the values of current and time at a half cycle of an alternating current

Time(ms)	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Current	6	13	22	39	55	67	75	59	4	0

Assuming the negative half is similar, find out the values of i) supply frequency, ii) maximum peak value, iii) mean average value, iv) RMS value, v) the instantaneous value of current after 1.4ms and 3.8ms.

4. Explain about real power, apparent power, reactive power and power factor of an alternating quantity
5. A coil of inductance 31.8mH is connected in series with a 7Ω resistor across a 230V, 50Hz supply. Calculate i) current, ii) phase angle, iii) power factor and iv) power consumed in the circuit.
6. A RC circuit with R=30Ω and C=79.5μF is supplied from a 230V, 50Hz supply. Find the i) Impedance, ii) Current, iii)Phase angle iv) power factor.
7. Define resonance, derive conditions for resonance in a series R,L,C circuit?
8. Explain the relation between voltages and currents in star and delta connections in 3-phase balanced system?
9. Derive the expression for resonant frequency and bandwidth for a series RLC resonant circuit.
10. A series RLC circuit consists of R=3Ω, L=2mH, C=0.4μF Determine the resonant frequency, Quality factor.
11. Determine the line currents when a star connected balanced load with an impedance of (15+j10)Ω is connected to 200V, three phase balanced supply in positive sequence.
12. Explain Phase difference? What is the frequency of AC power commonly used in residential buildings?

Unit-3 (Transformer)

1. Define transformer and explain the working principle of a transformer.
2. Define ideal transformer and derive the EMF equation of a single phase transformer. Define transformation Ratio.
3. Develop the equivalent circuit of a single phase transformer referred to primary and secondary.
4. Interpret in detail about working principle of auto transformer. Derive the expression for saving of copper in auto transformer.
5. Explain the various losses in a single phase transformer.
6. Explain various connections of three phase transformers with advantages, disadvantages and applications.
7. Discuss the difference of transformer and auto transformer with circuit diagrams.
8. Write the advantages and disadvantages, applications of auto transformer.
9. Define efficiency and regulation. Derive the condition for maximum efficiency of a transformer.

10. A 4500 V/225 V, 50 Hz single-phase transformer is to have an approximate e.m.f. per turn of 15 V and operate with a maximum flux of 1.4 T. Calculate (i) the number of primary and secondary turns and (ii) the cross-sectional area of the core
11. A 50 KVA, 1000/10000 V, 50Hz single phase transformer has iron loss of 1200W. The copper loss with 5 A in the high voltage winding is 500 W. Calculate the efficiency at i) 25 %, ii) 50 % iii) 100 % of normal load at power factor of 0.8.
12. A 400 KVA, 1- phase Transformer has an efficiency of 96%. At full load, if the maximum efficiency occurs at by 3/4 full-load Calculate that (i) iron losses (ii) Copper loss at Full load (iii) efficiency at half-load.

Unit-4 (Electrical Machines)

1. Explain the Construction and working of three phase induction motor.
2. Discuss the significance of torque slip characteristics of induction motor.
3. Describe the principle of working of DC machine (Motor & generator).
4. Explain the working principle of alternator with neat sketch.
5. Derive the condition for maximum torque under running condition of 3 phase induction motor.
6. Explain why the rotor is forced to rotate in the direction of rotating magnetic field in a 3 phase induction motor.
7. Describe the constructional difference between a squirrel cage rotor and slip ring rotor of an induction motor. Discuss their relative advantages and disadvantages.
8. Explain the construction of a DC machine.
9. Derive the Torque equation of a 3-Phase Induction Motor.
10. Derive the EMF equation of a DC machine.
11. List the losses in a DC machine and induction motor
12. The stator of a 3 phase, 2 pole induction motor is connected to 50Hz power supply. The rotor runs at 2995 rev/min at full load. Determine the synchronous speed and slip at full load of the motor.

Unit-5 (Electrical installation)

1. What is ELCB? Explain the working principle of ELCB. Mention advantages and disadvantages of ELCB.
2. Explain the different types of wires and cables.
3. Explain different types of primary and secondary batteries.
4. Explain the characteristics of batteries.
5. What is the main objective of Earthing any electrical installation and explain different types of Earthing with applications.
6. Explain the working of MCCB. Mention its advantages, disadvantages and applications.
7. What is the difference between MCB and MCCB?
8. What are the causes and drawbacks of low power factor, describe how it is

improved?

9. Discuss about the different components of LT switch gear and their protection advantages.
10. Explain about battery backup. What is the necessity of battery back-up .
11. Explain about MCB with neat sketch.
12. Distinguish between fuse unit and switch fuse unit.

INTRODUCTION TO ELECTRICAL ENGINEERING

Course Objectives:

- To understand DC and Single & Three phase AC circuits
- To study and understand the different types of DC, AC machines and Transformers.
- To import the knowledge of various electrical installations and the concept of power, power factor and its improvement.

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

CO1: Understand and analyze basic Electrical circuits
CO2: Study the working principles of Electrical Machines and Transformers
CO3: Introduce components of Low Voltage Electrical Installations.

UNIT-I:

D.C. Circuits: Introduction to R, L and C elements, Independent voltage and current sources, KVL & KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

UNIT-II:

A.C. Circuits: Introduction to sinusoidal waveforms, phasor representation, the concept of power and power factor, Analysis of 1-phase RLC series and parallel circuits, resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III:

Transformers: Principle of operation, equivalent circuit, losses, regulation and efficiency. Introduction to Auto-transformer.

UNIT-IV:

Electrical Machines: Principle of operation of DC machine, performance characteristics of dc shunt machine. Principle of operation of a 3-phase induction motor, torque-slip characteristics. Principle of operation of synchronous generator.

UNIT-V:

Electrical Installations: Components of LT Switchgear: SFU, MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, and Characteristics. Elementary calculations for energy consumption, power factor improvement and .battery backup.

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, “Basic Electrical Engineering”, Tata McGraw Hill, 2nd Edition, 2008.

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3. M. S. Sukhija, T. K. Nagsarkar, “Basic Electrical and Electronics Engineering”, Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, “Basic Electrical Engineering”, 2nd Edition, McGraw Hill, 2021.
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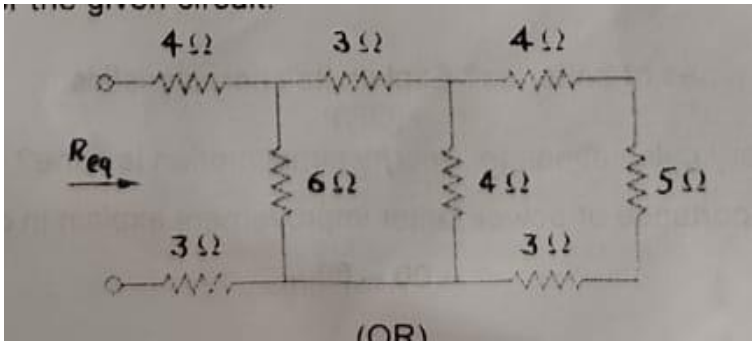
6. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
7. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989

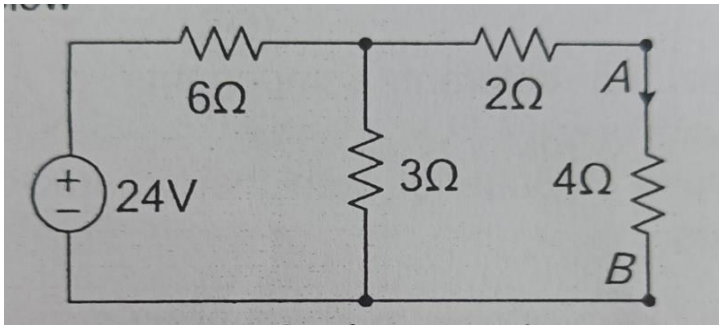
ASSIGNMENT QUESTIONS

Unit -I DC Circuits

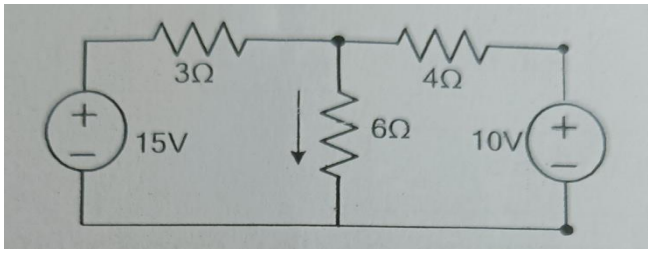
1. Explain the classification of Various Circuit Elements.
2. Elucidate in detail on various types of Voltage and Current sources.
3. Explain the KCL and KVL with examples.
4. Derive the V-I relationships of R, L and C elements.
5. Find the R_{eq} for the circuit shown in below figure



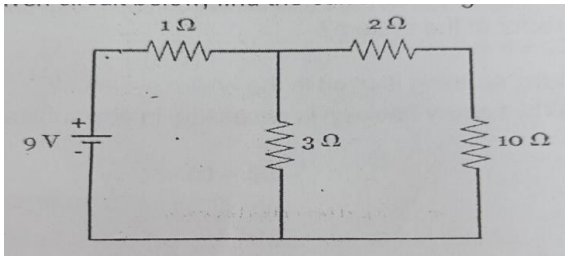
6. State Norton’s Theorem, Thevenin’s theorem, Superposition theorem
7. Using the Thevenin’s theorem, determine the current through the 4 Ohms resistor as shown in figure below



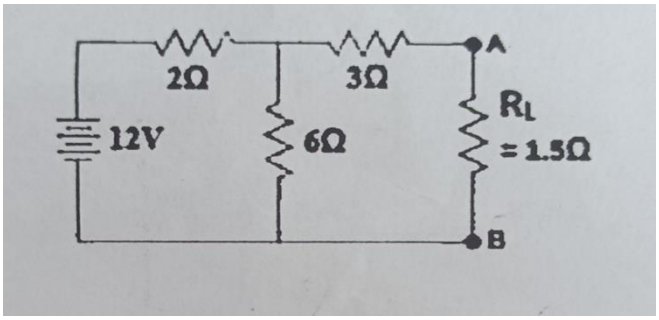
8. Using the Superposition theorem, Determine the current through the 6 Ohms resistor as shown in figure below



9. For the given circuit below, find the current through 10 Ohms resistor?



10. Find the current through the resistance R_L (1.5 Ohms) of the circuit shown in the figure below using Norton's equivalent circuit



11. Derive the expression for transient current in R-C circuit.
12. A series R-L circuit is supplied by the voltage. Determine the expression for i(t) when the switch is closed at t=0.

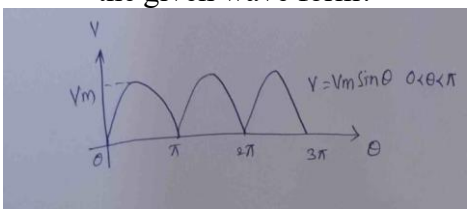
UNIT-2(AC circuits)

1. Define the following terms
   i)Frequency ii) Peak factor iii) Form factor iv) Average value v) RMS value
   vi)Instantaneous value of an alternating quantity
2. Derive an expression for Average value and RMS value of an alternating current wave $I=I_m \sin\omega t$.
3. The below table gives the values of current and time at a half cycle of an alternating current

Time(ms)	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5
Current	6	13	22	39	55	67	75	59	4	0

Assuming the negative half is similar, find out the values of i) supply frequency,
ii) maximum peak value, iii) mean average value, iv) RMS value, v) the instantaneous value of current after 1.4ms and 3.8ms.

4. Explain about real power, apparent power, reactive power and power factor of an alternating quantity
5. Define resonance, derive conditions for resonance in a series RLC circuit?
6. Explain the analysis of Series & Parallel RLC circuit?
7. Explain the relation between voltages, currents and power relations in a star and delta connections in 3-phase balanced system?
8. Derive the expression for resonant frequency and bandwidth for a series RLC resonant circuit.
9. A series RLC circuit consists of R=3Ω, L=2mH, C=0.4μF Determine the resonant frequency, Quality factor.
10. Explain Phase difference? What is the frequency of AC power commonly used in residential buildings?
11. Three equal impedances each of (8+j10) ohms, are connected in star. this is further connected to a 440V,50 Hz, three phase supply. calculate a) phase voltage b) phase angle c) phase current d) active power e) reactive power
12. Determine the RMS Value, Average value, form factor and Peak Factor of the given wave form?



UNIT-3 (Transformers)

1. Define transformer and explain the working principle of a transformer.
2. Define ideal transformer and derive the EMF equation of a single-phase transformer. Define transformation Ratio.
3. Develop the equivalent circuit of a single-phase transformer referred to primary and secondary.
4. Interpret in detail about working principle of auto transformer. Derive the expression for saving of copper in auto transformer.
5. Explain the various losses in a single-phase transformer.
6. Discuss the difference of transformer and auto transformer with circuit diagrams.
7. Write the advantages and disadvantages, applications of auto transformer.
8. What are ideal and practical transformers elaborate your answer
9. Define efficiency and regulation. Derive the condition for maximum efficiency of a transformer.
10. A 4500 V/225 V, 50 Hz single-phase transformer is to have an approximate e.m.f. per turn of 15 V and operate with a maximum flux of 1.4 T. Calculate (i) the number of primary and secondary turns and (ii) the cross-sectional area of the core

11. A 50 KVA, 1000/10000 V, 50Hz single phase transformer has iron loss of 1200W. The copper loss with 5 A in the high voltage winding is 500 W. Calculate the efficiency at i) 25 %, ii) 50 % iii) 100 % of normal load at power factor of 0.8.
12. A 400 KVA, 1- phase Transformer has an efficiency of 96%. At full load, if the maximum efficiency occurs at by 3/4 full-load Calculate that (i) iron losses (ii) Copper loss at Full load (iii) efficiency at half-load.

UNIT-4 (Electrical Machines)

1. Explain the working of three phase induction motor.
2. Discuss the significance of torque slip characteristics of induction motor.
3. Describe the principle of working of DC machine.
4. Explain the working principle of alternator with neat sketch.
5. Derive the condition for maximum torque under running condition of 3 phase induction motor.
6. Explain why the rotor is forced to rotate in the direction of rotating magnetic field in a 3-phase induction motor.
7. Explain the torque equation of a DC motor.
8. Derive the Torque equation of a 3-Phase Induction Motor.
9. Derive the EMF equation of a DC machine.
10. List the losses in a DC machine
11. The stator of a 3 phase, 2 pole induction motor is connected to 50Hz power supply. The rotor runs at 2995 rev/min at full load. Determine the synchronous speed and slip at full load of the motor.
12. Explain different types of losses in three phase induction motor

UNIT-5 (Electrical Installations)

1. What is ELCB? Explain the working principle of ELCB. Mention advantages and disadvantages of ELCB.
2. Explain the different types of wires and cables.
3. Explain different types of primary and secondary batteries.
4. Explain the characteristics of batteries.
5. What is the main objective of Earthing any electrical installation and explain different types of Earthing with applications.
6. Explain the working of MCCB. Mention its advantages, disadvantages and applications.
7. What is the difference between MCB and MCCB?
8. What are the causes and drawbacks of low power factor, describe how it is improved?
9. Discuss about the different components of LT switch gear and their protection advantages.
10. Explain about battery backup. What is the necessity of battery back-up .
11. Explain about MCB with neat sketch.
12. Distinguish between fuse unit and switch fuse unit.

ELEMENTS OF ELECTRICAL AND ELECTRONICS EINGINEERING

Course Objectives:

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase and three phase circuits
3. To study and understand the different types of DC, AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.
6. To introduce the concepts of diodes and transistors, and
7. To impart the knowledge of various configurations, characteristics and applications.

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

CO1: To analyze and solve electrical circuits using network laws and theorems.
CO2: To understand and analyze basic Electric and Magnetic circuits
CO3: To study the working principles of Electrical Machines
CO4: To introduce components of Low Voltage Electrical Installations
CO5: To identify and characterize diodes and various types of transistors.

UNIT - I:

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL and KCL, analysis of simple circuits with dc excitation.

A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits, Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT - II:

Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

UNIT - III:

Electrical Machines: Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three phase transformer connections. Construction and working principle of DC generators, EMF equation, working principle of DC motors, Torque equations and Speed control of DC motors, Construction and working principle of Three phase Induction motor, Torques equations and Speed control of Three phase induction motor. Construction and working principle of synchronous generators.

UNIT - IV:

P-N Junction and Zener Diode: Principle of Operation Diode equation, Volt, Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications.

Rectifiers and Filters: P-N junction as a rectifier, Half Wave Rectifier, Ripple Factor, Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

UNIT - V:

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations.

Field Effect Transistor (FET): Construction, Principle of Operation, Comparison of BJT and FET, Biasing FET.

TEXT BOOKS:

1. Basic Electrical and electronics Engineering, M S Sukija and TK Nagasarkar, Oxford University, 1st Edition, 2012
2. Basic Electrical and electronics Engineering, D P Kothari and I J Nagarath, McGraw Hill Education, 2nd Edition, 2020

REFERENCE BOOKS:

1. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, PEI and PHI,9th Edition, 2006.
2. Millman's Electronic Devices and Circuits,J. Millman, C. C. Halkias and Satyabrata Jit, TMH, 2nd Edition, 1998.
3. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, McGraw Hill, 6th Edition, 1971.
4. Linear circuit analysis, Raymond A. De Carlo and Pen, Min, Lin, Oxford University Press, 2nd edition, 2004.
5. Network Theory, N. C. Jagan and C. Lakshminarayana, McGraw Hill, 2nd Edition, 2005.
6. Network Theory, Sudhakar and Shyam Mohan Palli, Tata McGraw Hill, 2nd Edition, 2011.
7. Fundamentals of Electrical Engineering, L. S. Bobrow, Oxford University Press, 12th edition, 2003.
8. Electrical and Electronic Technology, E. Hughes, Pearson Education, 10th Edition, 2010.
9. Electrical Engineering Fundamentals, V. D. Toro, Prentice Hall India, 2nd Edition, 1989

ASSIGNMENT QUESTIONS

Unit -1 (DC & AC CIRCUITS)

1. Derive the voltage and current relations in 3-Phase Star connected system and delta connected system?
2. Define and derive Average value and RMS Value for a sinusoidal quantity.
3. Three similar coils A,B,C are available Each coil has a 9Ω resistance and a 12Ω reactance They are connected in delta to a three-phase 440V,50Hz, supply Calculate for this load the (a)phase current (b)line current (c) power factor (d)total KVA (e)active power(f)reactive power if these coils are connected in star across the same supply, Calculate all the above quantities.
4. A circuit of three resistor 15Ω, 21Ω and 39Ω respectively joined in parallel is connected in series with fourth resistance. The whole circuit is applied with 60V and is found that the power dissipated in the 15Ωresistor is 36W. Determine the value of the fourth resistance and the total power dissipated in the circuit?

5. Analyze RL Series circuit excited by A.C. source with necessary diagrams and equations.
6. Explain the differences between series circuit and parallel circuits.
7. What are the advantages of star and delta connections?
8. Explain the KCL and KVL with examples?
9. Determine the unknown current I through the node, which is connected with 3 more branches in which two branch currents are 4A and 6A flowing towards the junction and third branch current 2A is flowing away from node.
10. Analyze RL Series circuit excited by A.C. source with necessary diagrams and equations.
11. A coil has a reactance of 25 ohms and an inductance of 1 Henry. If an A.C. voltage of 200 V (rms), 50 Hz is applied across the coil, find the input current, power factor, real power and reactive power flow in the coil Write a note on the following: a) MCB b) Power factor improvement
12. Explain the voltage divider and current divider rule for resistances connected in series and parallel. b) Three resistors are connected in series across a 12 V battery. The first resistance has value of 2 Ω, second has voltage drop of 4V and third has a power dissipation of 12W. Calculate the value of circuit current.

Unit -2 (ELECTRICAL INSTALLATIONS)

1. Explain the power factor improvement methods? List out the advantages of power factor improvement in electrical systems.
2. Explain the working principle of MCCB?
3. Give the construction and the working of a lead acid storage battery
4. What is the necessity of earthing the electrical equipment? Give a cross-sectional view of the earthing
5. Explain how Synchronous Condenser can be used to improve the power factor.
6. Differentiate between MCB and MCCB?
7. What are the different types of wires? What is the function of fuse? Explain about different fuses?
8. Explain about various types of batteries and write important characteristics for batteries.
9. With necessary diagrams, explain various components of L.T. switch gear.
10. List the different types of cables. What are the advantages of earthing?
11. Explain in detail about the important characteristics for Batteries.
12. Describe the pipe earthing used in electrical installations with a neat diagram.

Unit-3 (ELECTRICAL MACHINES)

1. Explain the working principle of single-phase transformer? Obtain the equivalent circuit of a single phase transformer? Derive the EMF equation of a single phase transformer.
2. Explain speed control methods & working principle of DC motor and Derive an expression for torque equation in DC motors?

3. Describe the constructional differences between a squirrel cage rotor and wound rotor of an induction motor. Discuss their relative advantages and disadvantages. Discuss the principle of operation of Induction Motor.
4. What is rotating magnetic field? What is its significance? How is it produced?
5. Explain the construction details and working of single-phase transformer and list the applications of transformer. What are the advantages of three phase transformer over single phase transformers?
6. Draw and explain the torque-slip characteristics of an induction motor.
7. A 250V shunt motor runs at 1000 rpm at no load and takes 8A. The total armature and shunt field resistances are 0.2Ω and 250 Ω respectively. Calculate the speed when loaded and taking 50A. Assume the flux to be constant.
8. What is voltage regulation of a transformer? Obtain the conditions for maximum and zero voltage regulation in a transformer.
9. A 100 kVA, 2400/240 V, 50Hz single phase transformer has an exciting current of 0.64A and a core loss of 700 W, when its high voltage side is energized at rated voltage and frequency. Calculate the two components of the exciting current.
10. An 8 pole DC generator has 500 armature conductors and useful flux per pole of 0.065 wb. What will be the EMF generated if it is lap connected and runs at 1000 rpm? At what speed it must be driven to produce the same EMF if it is wave connected?
11. An 8 pole lap connected armature has 40 slots with 12conductors per slot, generates a voltage of 500V. Determine the speed at which it is running if the flux per pole is 50mWb.
12. What are the losses that occur in a transformer and how can these losses be reduced?

Unit-4 (DIODES, RECTIFIERS AND FILTERS)

1. Draw circuit of a half-wave rectifier and show the input and output voltage waveforms.
2. Explain the operation of a full wave rectifier with a neat diagram and output waveforms.
3. Explain the characteristics of zener diode?
4. Draw the circuit diagram of a half-wave rectifier, and explain its operation
5. Draw the circuits of a full wave rectifier using 2-diodes and 4-diodes. Discuss the relative merits and demerits
6. Describe the PNP transistor in common Emitter configuration. How the transistor is used as an amplifier?
7. Explain the V-I characteristics of PN Junction diode with neat diagrams and explain. What is Static Resistance and Dynamic Resistance?
8. Explain the operation of full wave bridge rectifier with relevant circuit and Waveform.
9. Explain the forward and reverse characteristics of a silicon diode.
10. With a neat circuit diagram and waveforms, explain the working of Bridge rectifier without filter.
11. With the help of suitable diagram, explain VI characteristics of Zener diode.

12. Illustrate the working of RC-π filter. Draw circuit of a half-wave rectifier and show the input and output voltage waveforms.

Unit -5 (TRANSISTORS)

1. Explain the constructional details of a Bipolar Junction Transistor.
2. How the transistor is used as an amplifier? Why the BJT is called a current controlled device.
3. What is early effect?
4. What is meant by depletion region in JFET? Explain with suitable diagrams what are the basic differences between BJT and JFET?
5. Illustrate the input and output characteristics of BJT in three configurations. Compare CE, CB and CC configurations of BJT?
6. Differentiate between NPN and PNP transistor construction
7. Define BJT? What are the applications of BJT? Explain operation of FET? What are the advantages of FET?
8. Explain the construction details, principle and working of FET. What are the advantages of FET?
9. Illustrate the working of RC-π filter.
10. Draw and explain the characteristics of an N-channel JFET.
11. With a neat diagram explain the operation of an PNP transistor.
12. With the help of suitable diagram, explain construction and operation of P-channel JFET.

ENGINEERING DRAWING AND COMPUTER AIDED DRAFTING

Course Objectives:
1. To introduce the fundamentals of engineering drawing and projection systems.
2. To develop skills in constructing orthographic, isometric, and sectional views.
3. To train students in interpreting and creating technical drawings using CAD tools.
4. To familiarize students with dimensioning standards and drafting conventions.
5. To bridge manual drafting techniques with computer-aided drafting practices.

Course Outcomes: At the end of the course, the student will be able to:
1. Understand and apply the principles of orthographic and isometric projections.
2. Create sectional views and dimensioned drawings using BIS standards.
3. Use CAD software to generate 2D engineering drawings.
4. Visualize and construct solid models from 2D views.
5. Interpret and produce engineering drawings of mechanical components and assemblies.
6. Demonstrate drafting skills for practical and industrial applications.

UNIT – I: Introduction to Engineering Graphics (Conventional)
Principles of Engineering Graphics and their Significance, Geometrical Constructions, Scales, Plain and Diagonal, Conic Sections including the Rectangular Hyperbola, General method only. Cycloid, Epicycloid and Hypocycloid.

UNIT - II: Orthographic Projections (Conventional and Computer Aided)
Principles of Orthographic Projections, Conventions, Projections of Points and Lines, Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections, points, lines and planes. Introduction to Computer aided drafting, views, commands and conics.

UNIT – III: Projections of Regular Solids (Conventional and Computer Aided)
Auxiliary Views, Sections or Sectional views of Right Regular Solids, Prism, Cylinder, Pyramid, Cone, Auxiliary views, Computer aided projections of solids, sectional views

UNIT – IV: Development of Surfaces (Conventional):
Prism, Cylinder, Pyramid and Cone.

UNIT – V: Isometric Projections (Conventional and Computer Aided)
Principles of Isometric Projection, Isometric Scale, Isometric Views, Conventions, Isometric Views of Lines, Plane Figures, Simple and Compound Solids, Isometric Projection of objects having non, isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice- versa, Conventions. Conversion of orthographic projection into isometric view.

Note: The End Semester Examination will be in conventional mode.
1. CIE – I will be in conventional mode.
2. CIE – II will be in conventional mode/Computer.

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhatt, Charotar, 54th Edition, 2023.
2. Engineering Drawing and graphics Using AutoCAD, T. Jeyapoovan and Vikas, S. Chand and company Ltd., 3rd Edition, 2010.

REFERENCE BOOKS:

1. Engineering Drawing, Basant Agrawal and C.M. Agrawal, McGraw Hill, 3rd Edition, 2019.
2. Engineering Graphics and Design, WILEY, John Wiley and Sons Inc, 3rd Edition, 2020.
3. Engineering Drawing, M. B. Shah and B.C. Rane, Pearson, 2nd Edition, 2009.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford, 1st Edition, 2015.
5. Computer Aided Engineering Drawing, K. Balaveera Reddy, CBS Publishers, 2nd Edition, 2015

ASSIGNMENT QUESTIONS

UNIT-I

1. A rectangular plot of land measuring 1.28 hectares is represented on a map by a similar rectangle of 8 sq.cm. Calculate R.F. of the scale. Draw a diagonal scale to read 1 m and long enough to measure 600 m. Show a distance of 438 m on it.
2. Construct a diagonal scale showing yards, feet and inches in which 2 inches long line represents 1.25 yards and is long enough to measure up to 5 yards. Find R.F and mark a distance of 4 yards 2 feet 8 inches.
3. A line of 1 centimetre represents an actual length of 4 dm. Draw a plain scale and mark a distance of 6.7 m on it.
4. Construct a scale of 1:14 to read feet and inches and long enough to measure 7 feet. Show a distance of 5 feet 10 inches on it.
5. Draw a cycloid of a circle of diameter 50 mm for one revolution. Also, draw a tangent and a normal to the curve at a point 35 mm above the base line.
6. Construct an ellipse when the distance between the focus and the directrix is 30 mm and the eccentricity is 3/4. Draw tangent and normal at any point on the curve.
7. Draw an epicycloid of a circle of diameter 50 mm, which rolls outside a circle of diameter 180 mm for one revolution. Also, draw a tangent and a normal to the epicycloid at a point 135mm from the centre of the directing circle.
8. The distance between two stations is 100 km and on a road map it is shown by 30cm. Draw a diagonal scale and mark 46.8 km and 32.4 km on it.
9. Construct an Hyperbola when the distance between the focus and the directrix is 30 mm and the eccentricity is 4/3. Draw tangent and normal at any point on the curve.
10. Draw a rectangular hyperbola using the ‘orthogonal asymptotes ‘method when the position of a point P on the curve is at a distance of 35 mm and 50 mm from two asymptotes.
11. Construct a hypocycloid taking the diameter of the generating circle and radius of directing circle as 60 mm.
12. Draw a hypocycloid of a circle of diameter 50 mm, which rolls inside a circle of diameter 180 mm for one revolution. Also, draw a tangent and a normal to the hypocycloid at a point 50 mm from the centre of the directing circle.

UNIT-2

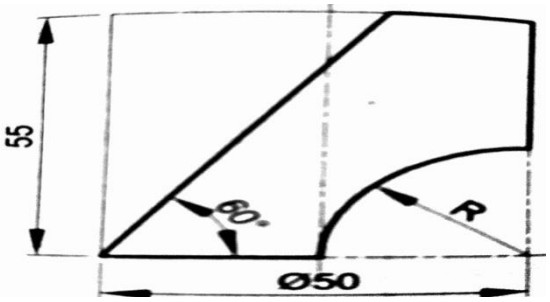
1. A point is 30 mm from the H.P and 50 mm from the V.P. draw the projections of point A, in all possible positions keeping the projectors 40 mm apart.
2. Draw the projections of the following points on a common reference line keeping the distance between their projectors 25 mm apart.
   (a) Point A is 40 mm above the H.P. and 25 mm in front of the V.P.
   (b) Point B is 40 mm above the H.P. and in the V.P.
   (c) Point C is 25 mm in front of the V.P. and in the H.P.
   (d) Point D is 25 mm above the H.P. and 30 mm behind the V.P.
   (e) Point E is in the H.P. and 30 mm behind the V.P.
   (f) Point F is 40 mm below the H.P. and 30 mm behind the V.P.
   (g) Point G is 25 mm below the H.P. and 40 mm in front of the V.P.
   (h) Point H is in the V.P. and 30 mm below the H.P.
3. A straight Line PQ has its end P 20 mm above the H.P and 30 mm in front of V.P and the end Q is 80 mm above H.P and 70 mm in front of V.P If end projectors are 60 mm apart. Draw the projections of line. Determine its True Inclinations.
4. A 100 mm long PQ is inclined at 30^0 to the H.P and 45^0 to the V.P. Its mid point is 35 above H.P and 50 mm in front of the V.P., Draw its projections.
5. A line AB 75 mm long makes 45^0 inclination with V.P while its F.V makes 55^0 end A is 10 mm above H.P and 15 mm in front of V.P. Draw its projections and find its inclination with H.P.
6. A Circular plate of negligible thickness and 50 mm diameter appears as an ellipse in the front view, having major axis 50 mm and minor axis 30 mm long. Draw its top view when the major axis of the ellipse is horizontal.
7. A pentagonal plane of side 30 mm has an edge on the H.P. Its surface is inclined at 45° to the H.P. and the edge on which the plane rests is inclined at 30°to the V.P. Draw its projections.
8. A hexagonal plane of side 30 mm rests on the V.P. on an edge such that the surface is inclined at 45^0 to the V.P. and edge on which it rests is inclined at 30^0 to the H.P. Draw its projections.
9. A semicircular plate of 80 mm diameter has its straight edge on the V.P. and inclined at 30^0 to the H.P., while the surface of the plate is inclined at 45^0 to the V.P. Draw the projection of the plate.
10. A plate having shape of an isosceles triangle has 50 mm long base and 70 mm altitude .It is so placed that in the front view it is seen as an equilateral triangle of 50 mm side and one side inclined at 45^0 to XY. Draw its top view.
11. The diagonals of a rhombus measure 100 mm and 40 mm. The longer diagonal is inclined at 30° to H.P. with an end in H.P. and the smaller diagonal is parallel to both the principal planes. Draw its projections.
12. A rectangular plane of edges 35 mm and 70 mm is resting on an edge in the H.P. The surface is inclined to the H.P. such that the top view appears as a square. Draw its projections when the edge resting on the H.P. is inclined at 30° to the V.P.

UNIT-3

1. A square pyramid of base side 40 mm and axis 50 mm has a triangular face on the ground and the axis inclined at 45° to the V.P. Draw its projections.
2. A cylinder of base diameter 50 mm and axis 70 mm has a point of its base circle in the V.P. Its axis is inclined at 30° to the V.P. and 45° to the H.P. Draw its projections.
3. A Pentagonal Prism of 35 mm base side and 70 mm long axis has its axis inclined at 30^0 to the V.P. An edge of its base is in the V.P and inclined at 45^0 to the H.P Draw its projections.
4. A Hexagonal pyramid of 25 mm base side and 55 mm long axis has one of its slant edges on the ground. A Plane containing that edge and the axis is perpendicular to H.P. and inclined at 45^0 to V.P. Draw its projections, when the apex is near to V.P. then the base.
5. A right circular cone of diameter 70 mm and axis height 80 mm is resting on one of its generators in H.P. The top View of the axis is inclined at 45^0 to V.P. Draw the projection of the cone
6. A square pyramid of base side 40 mm and axis 60 mm is resting on its base on the H.P. with a side of base parallel to the V.P. Draw its sectional views and true shape of the section, if it is cut by a section plane perpendicular to the V.P., bisecting the axis and is (a) parallel to the H.P., (b) Inclined at 45° to the H.P. (c) inclined at 60° to the H.P.
7. A hexagonal pyramid of 30 mm side of base and 60 mm long axis rests with its base on H.P. and one of the edges of the base is parallel to V.P. It is cut by a horizontal section plane at a distance 30 mm above the base .Draw the F.V and Sectional T.V.
8. A cone with 60 mm base diameter and 70 mm long axis is resting on its base on the H.P. It is cut by a section plane whose H.T. is inclined at 60^0 to the reference line and passes through a point that is 20 mm away from the axis. Draw its sectional F.V and obtain true shape of the section.
9. A cone of base diameter 50 mm and axis 60 mm is resting on its base on the H.P. It is cut by an A.I.P. inclined at 45° to the H.P. and passing through a point on the axis, 20 mm above the base. Draw its sectional top view and obtain true shape of the section..
10. A cylinder of base diameter 50 mm and axis 60 mm is resting on its base on the H.P. It is cut by a section plane perpendicular to V.P., the V.T. of which cuts the axis at a point 40 mm from the bottom face and inclined at 45° to the reference line. Draw its front view, sectional top view and true shape of the section.
11. A pentagonal pyramid of base side 30 mm and axis 60 mm is resting on its base on the H.P. with an edge of the base nearer the V.P., parallel to it. A vertical section plane inclined at 45° to the V.P. cuts the pyramid at a distance of 8 mm from the axis. Draw its sectional front view, top view and true shape of the section.
12. A cylinder is cut by an auxiliary inclined plane such that the true shape of the section is an ellipse of major and minor axes as 70 mm and 50 mm respectively. The smallest generator of the truncated cylinder is 15 mm. Draw its projections and obtain the true shape of the section. Determine the inclination of the section plane.

UNIT-4

1. Draw the development of lateral surface of a square pyramid with a 40 mm base side and a 60 mm long axis, resting on its base in the H.P. such that a side of the base is parallel to the V.P.
2. A cylinder of 40 mm diameter of base and 55 mm long axis is resting on its base on H.P. It is cut by a section plane perpendicular to V.P. and inclined at 45^0 to H.P. The section plane is passing through the top end of an extreme generator of the cylinder. Draw the development of the lateral surface of the cut cylinder.
3. A pentagonal prism, having a base with a 30 mm side and a 70 mm long axis , is resting on its base on the H.P. such that one of the rectangular faces is parallel to the V.P. It is cut by an auxiliary inclined plane whose V.T. is inclined at 45^0 with the reference line and passes through the mid-point of the axis. Draw the development of the lateral surface of the truncated prism.
4. Develop a lateral surface shows the front view of a truncated cylinder of diameter 50 mm resting on its base on the H.P. Draw the development of its lateral surface.



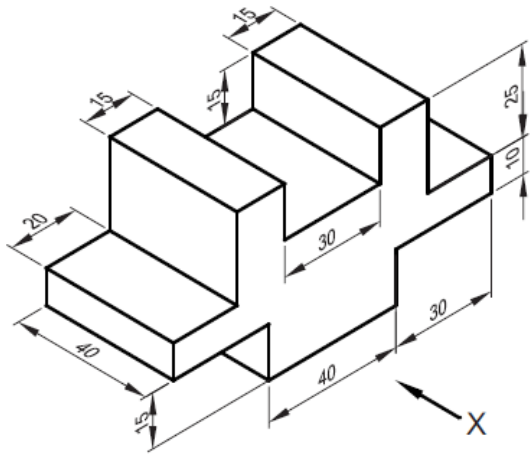
5. Develop a cone of base diameter 50 mm and axis 60 mm is resting on its base on the H.P. Draw the development of its lateral surface when it is cut by an auxiliary inclined plane inclined at 60^0 to the H.P and bisecting the axis.
6. A square hole of 25 mm side is cut in a cylindrical drum of 50 mm diameter and 70 mm height. The faces of the hole are inclined at 45^0 to the H.P and axis intersects with that of the drum at right angles .Draw the development of its lateral surface.
7. A cone of 60 mm base diameter and 75 mm long axis is resting on its base on the H.P. A square hole of 20 mm side is made in it such that axis of the hole intersect the axis of the cone at a height of 25 mm from the base and the faces of hole are equally inclined to the H.P. Draw the development of its lateral surface.
8. A pentagonal pyramid of 30 mm base side and 60 mm axis, rests on its base in the H.P. It is cut by two section plane while meet at a height of 20 mm from the base .One of the section planes is horizontal, while the other is an auxiliary inclined plane whose V.T. makes 45^0 with H.P. Draw the development of the lateral surface of the solid when apex is removed.
9. A hexagonal prism of base side 30 mm and axis 70 mm is resting on its base on the ground with a side of base inclined at 45° to the V.P. It is cut by an auxiliary inclined plane inclined at 45° to the H.P. and passes through a point 15 mm below the top end of the axis. Draw the development of the lateral surface of the truncated prism.
10. A cylindrical drum of base diameter 50 mm and axis 70 mm is resting on its base on the H.P. A square hole of side 40 mm is cut through the drum such that one of the faces of the square hole is inclined at 30° to the H.P. The axis of the hole is perpendicular to the V.P.

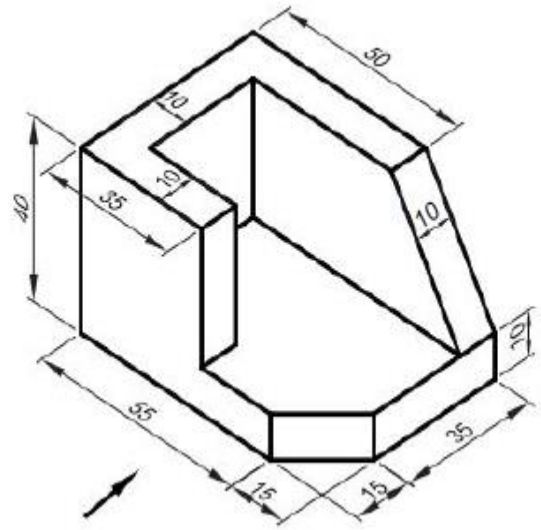
and is 10 mm away from the axis of the cylinder. Draw the development of the retained cylinder.

11. A square pyramid of base side 40 mm and axis 60 mm is resting on its base on the H.P. such that all the sides of the base are equally inclined to the V.P. It is cut by a section plane perpendicular to the V.P. and inclined at 60° to the H.P., bisecting the axis. Draw the development of its lateral surface.
12. A square pyramid of base side 40 mm and axis 60 mm is resting on its base on the H.P. such that a side of the base is parallel to the V.P. It is cut by a section plane perpendicular to the V.P. and inclined at 45° to the H.P., bisecting the axis. Draw the development of its lateral surface.

UNIT-5

1. Draw isometric view of a cylinder of 50 mm base diameter and 70 mm long axis when the axis is perpendicular to the (a) H.P., (b) V.P.
2. Draw isometric view of a Cone of 50 mm base diameter and 70 mm long axis when the axis is perpendicular to the (a) H.P., (b) V.P.
3. Draw an isometric projection of the frustum of a hexagonal pyramid having 40 mm base side, 25 mm long top side and 60 mm height
4. Draw an isometric projection of the frustum of a cone of 50 mm base diameter, 25 mm top diameter and 60 mm height.
5. A hexagonal prism of base side 30 mm and axis 70 mm is resting on its base on the H.P. with a side of the base parallel to the V.P. It is cut by an A.I.P. inclined at 45° to the H.P. and bisecting the axis. Draw its isometric view.
6. A cube of 25 mm edge is placed centrally on the top of another square block of 40mm edge and 15 mm thickness. Draw the isometric drawing of two solids.
7. A square pyramid rests centrally over a cylindrical block. Draw the isometric projection of the arrangement. Consider the pyramid has a base with 25 mm side 40 mm long axis whereas the cylindrical block has a base 50 mm diameter and 20 mm thickness.
8. A cone is placed centrally on the top of a cube of 40 mm side which is placed centrally over a cylindrical block. The cone has its base diameter 30 mm and axis 30 mm. The cylindrical block has its base diameter 70 mm and thickness 20 mm. Draw isometric projection of the arrangement.
9. Pictorial View of an object is shown in figure using fist angle projection, Draw its (i) Front view (ii) top view and (iii) side views. use the direction X for the front view.

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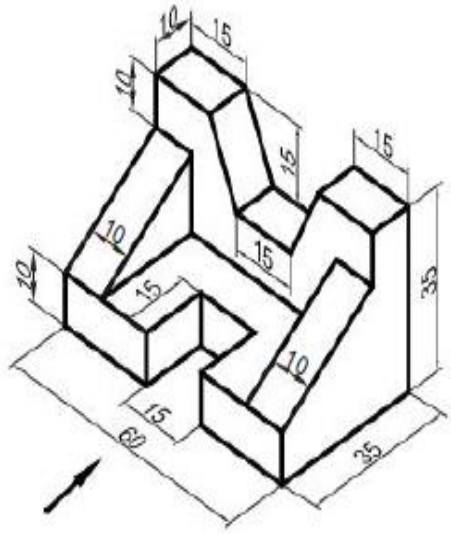
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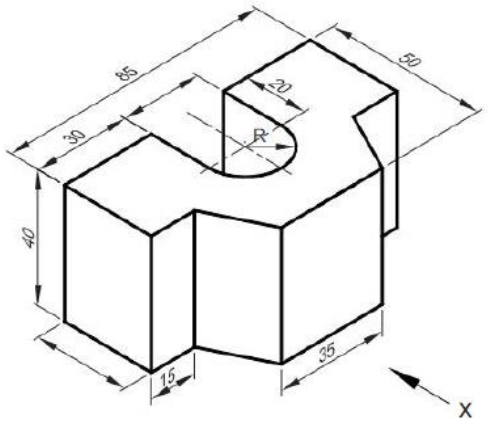
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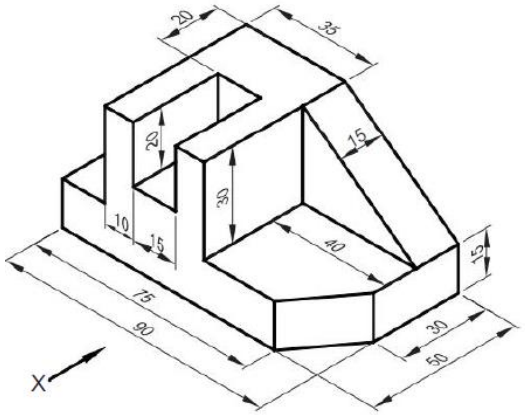
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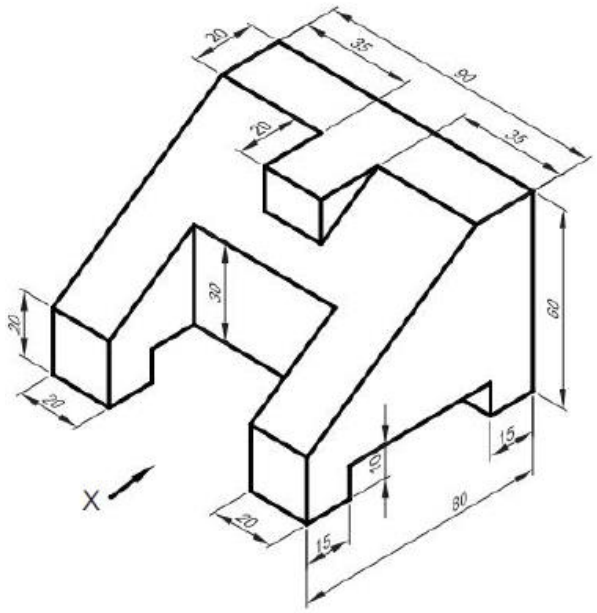
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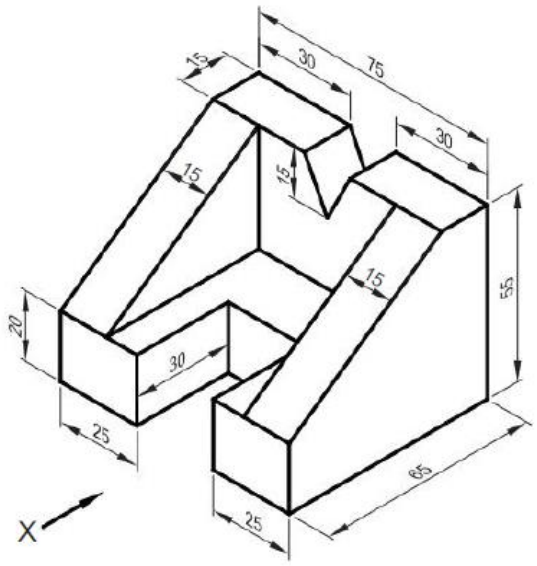
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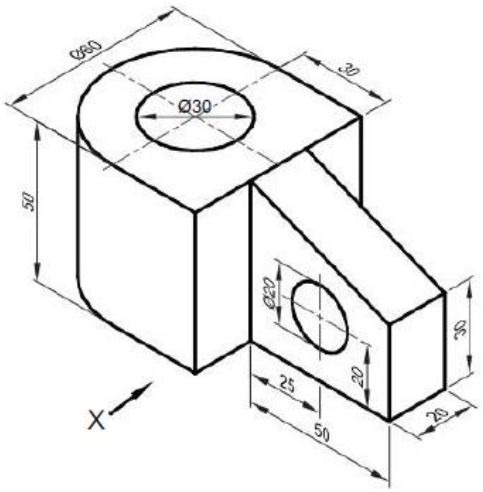
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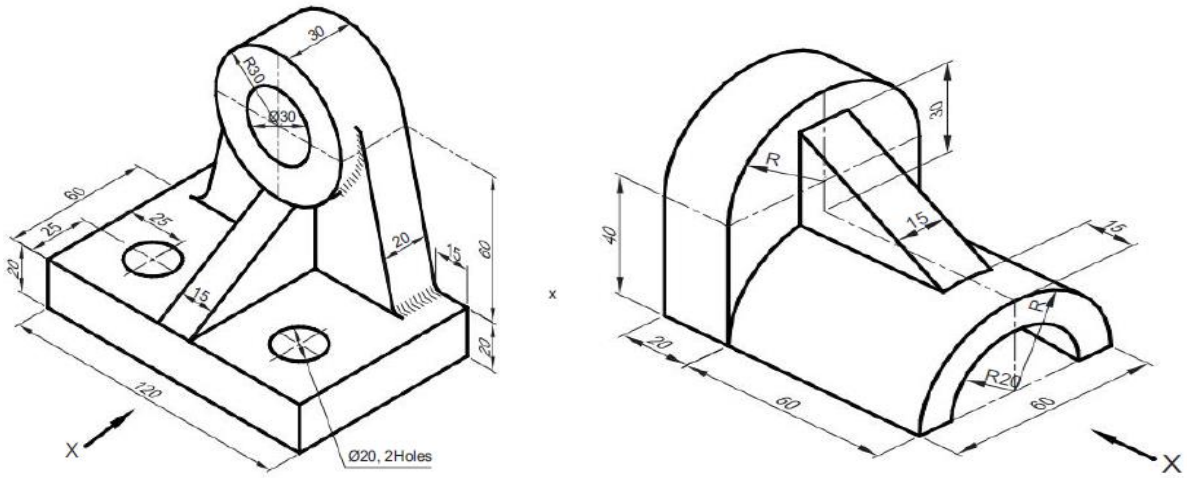
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ENGLISH FOR SKILL ENHANCEMENT

INTRODUCTION

National Education Policy-2020 aims at preparing students with knowledge, skills, values, leadership qualities and initiates them for lifelong learning. It also emphasizes language study and promotion of languages through understanding and proper interpretation. English language is central to the educational eco system. The importance of language as medium of communication for personal, social, official and professional needs to be emphasized for clear and concise expression. Teaching and learning of receptive and productive skills viz., Listening, Speaking, Reading and Writing (LSRW) are to be taught and learnt effectively in the undergraduate Engineering programs. Learners should be encouraged to engage in a rigorous process of learning to become proficient users of English language by adopting a deeply focused and yet flexible approach as opposed to rote learning.

In this connection, suitable syllabus, effective pedagogy, continuous assessments and students' involvement result in productive learning. This course supports the latest knowledge and skill requirements and shall meet specified learning outcomes. The main objectives of English language teaching and learning as medium of communication and for promotion of cultural values are embedded in this syllabus. Efforts are being made in providing a holistic approach towards value-based language learning which equips the learner with receptive as well as productive skills.

The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed textbook for detailed study. The students should be encouraged to read the texts leading to reading comprehension. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material.

LEARNING OBJECTIVES: This course will enable the students to:

a. Improve their vocabulary.
b. Use appropriate sentence structures in their oral and written communication.
c. Develop their reading and study skills.
d. Equip students to write paragraphs, essays, précis and draft letters.
e. Acquire skills for Technical report writing.

COURSE OUTCOMES: Students will be able to:

a. Choose appropriate vocabulary in their oral and written communication.
b. Demonstrate their understanding of the rules of functional grammar and sentence structures.
c. Develop comprehension skills from known and unknown passages.
d. Write paragraphs, essays, précis and draft letters.
e. Write abstracts and reports in various contexts.

SYLLABUS: The course content / study material is divided into **Five Units.**

UNIT –I

Theme: Perspectives

Lesson on 'The Generation Gap' by Benjamin M. Spock from the prescribed textbook titled *English for the Young in the Digital World* published by Orient Black Swan Pvt. Ltd.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Words Often Misspelt - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Parts of Speech particularly Articles and Prepositions — Degrees of Comparison

Reading: Reading and Its Importance- Sub Skills of Reading – Skimming and Scanning.

Writing: Sentence Structures and Types -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing Precisely –Nature and Style of Formal Writing.

UNIT –II

Theme: Digital Transformation

Lesson on '*Emerging Technologies*' from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Reading Strategies-Guessing Meaning from Context – Identifying Main Ideas – Exercises for Practice

Writing: Paragraph Writing — Types, Structures and Features of a Paragraph - Creating Coherence — Linkers and Connectives - Organizing Principles in a Paragraph — Defining- Describing People, Objects, Places and Events — Classifying- Providing Examples or Evidence - Essay Writing - Writing Introduction and Conclusion.

UNIT –III

Theme: Attitude and Gratitude

Poems on '*Leisure*' by William Henry Davies and '*Be Thankful*' - Unknown Author from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading – Identifying Topic Sentence and Providing Supporting Ideas - Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint,

Letter of Requisition, Job Application with CV/Resume –Difference between Writing a Letter and an Email - Email Etiquette.

UNIT –IV

Theme: **Entrepreneurship**
Lesson on '*Why a Start-Up Needs to Find its Customers First*' by Pranav Jain from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Standard Abbreviations in English – Inferring Meanings of Words through Context – Phrasal Verbs — Idioms.

Grammar: Redundancies and Clichés in Written Communication – Converting Passive to Active Voice and Vice-Versa.

Reading: Prompt Engineering Techniques– Comprehending and Generating Appropriate Prompts - Exercises for Practice

Writing: Writing Practices- Note Making-Précis Writing.

UNIT –V

Theme: **Integrity and Professionalism**
Lesson on '*Professional Ethics*' from the prescribed textbook titled *English for the Young in the Digital World* published by Orient BlackSwan Pvt. Ltd.

Vocabulary: Technical Vocabulary and their Usage– One Word Substitutes – Collocations.

Grammar: Direct and Indirect Speech **-** Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) – Inferring the Meaning and Evaluating a Text- Exercises for Practice

Writing: ***Report Writing - Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Technical Report.***

Note: ***Listening and Speaking skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.***

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

TEXT BOOK:

1. Board of Editors. *2025. English for the Young in the Digital World.* Orient Black Swan Pvt. Ltd.

REFERENCE BOOKS:

1. Swan, Michael. (2016). *Practical English Usage.* Oxford University Press. New Edition.
2. *Karal, Rajeevan. 2023. English Grammar Just for You.* Oxford University Press. New Delhi
3. 2024. *Empowering with Language: Communicative English for Undergraduates.* Cengage Learning India Pvt. Ltd. New Delhi
4. Sanjay Kumar & Pushp Lata. 2022. *Communication Skills – A Workbook.* Oxford University Press. New Delhi
5. Wood,F.T. (2007). *Remedial English Grammar.* Macmillan.
6. Vishwamohan, Aysha. (2013). *English for Technical Communication for Engineering Students.*
   Mc Graw-Hill Education India Pvt. Ltd.

ASSIGNMENT QUESTIONS

Unit 1- THE GENERATION GAP

1. Explain the title of the chapter "The Generation Gap" written by Benjamin McLane Spock.
2. Write about the positive side of rebelliousness as discussed in the lesson "The Generation Gap."
3. According to the lesson "The Generation Gap," how can unconscious fears influence a teenager's academic performance, especially when they are following in a parent's professional footsteps?
4. Explain the techniques for effective reading and discuss the importance of reading.
5. Explain in detail the techniques for writing precisely.
6. What are some examples of productive and unproductive adolescent rebelliousness, according to the author Benjamin McLane Spock?
7. From the lesson "The Generation Gap," what are some indirect ways in which adolescents from educated, professional families express their rebelliousness?
8. According to Benjamin McLane Spock, what are the three principal elements that make up an individual's identity?
9. Compare and contrast the experiences of adolescent rebellion in different social and family contexts, as illustrated in the lesson "The Generation Gap."
10. From the lesson "The Generation Gap," what is the first formative influence on an individual?

Unit 2 - Emerging Technologies

1. What are emerging technologies and why are they important according to the lesson 'Emerging Technologies'?
2. How did Artificial Intelligence (AI) improve in the 2010s according to the lesson 'Emerging Technologies'?
3. Give two examples of the everyday applications of the Internet of Things (IoT) discussed in the lesson "Emerging Technologies."
4. What are two applications of nanotechnology mentioned in the lesson "Emerging Technologies"?
5. Why is it important to think about ethics and social impact when developing new technologies according to the lesson 'Emerging Technologies'?
6. Discuss how emerging Technologies such as Artificial Intelligence, Biotechnology and Quantum Computing are transforming different industries. Provide examples to support your answer from the lesson 'Emerging Technologies'.
7. What are skimming and scanning techniques of reading?
8. Write a passage of about 150 to200 words on any **one** of the following topics given below
   a) The pen is mightier than the sword.
   b) Actions speak louder than words.
9. Write a description of the first time you used ChatGPT or any other generative AI application. Convey what your thoughts and mood were.
10. Write an essay on any one of the topics given below

a) The benefits of diversity in society
b) What super power would you choose to have and why?
c) Technology is ruining our ability to communicate

UNIT -3 -ATTITUDE AND GRATTITUDE

1. Explain the central theme of the poem "Leisure" by W. H. Davies.
2. According to the poem, what does the personification of beauty suggest about beauty and our interaction with it?
3. Explain in detail the meaning of the following lines: 'No time to see, in broad daylight,/ Streams full of stars, like skies at night.' Comment on the images and literary devices used in this couplet.
4. Pick out the images of nature in the poem. Why do you think the poet use these specific images?
5. Discuss the philosophy of personal growth presented in the poem 'Be Thankful'.
6. According to the poem 'Be Thankful', what is the ultimate outcome that comes from practising gratitude? Do you think it is an approach we should implement in our daily lives? Give reasons for your answer.
7. Write a letter to the youth Hostels association of India, asking them to send you information about their annual trekking expedition in the Himalayan region. Be specific about the kind of information you seek.
8. You have completed your undergraduate studies and require a transfer certificate in order to apply for a postgraduate course at JNTU Hyderabad. Write a letter to your principal requesting for the necessary certificate.
9. You are a graduate in Chemical Engineering from NISER, Bhubaneswar. You have three years of experience as an Assistant Project Engineer in a fertilizer company. Write a job application letter in response to an opening for the post of Project Engineer in a reputed petrochemical company. Also, prepare a résumé/CV for the same.
10. Write an e-mail to a book shop complaining about receiving damaged copies of the book you had ordered.
11. Explain intensive and extensive reading, and describe the main techniques used in both.

UNIT-4 - ENTREPRENEURSHIP
WHY A START-UP NEEDS TO FIND ITS CUSTOMERS FIRST

1. Explain the significance of the line 'Every traveler starting a journey must decide what road to take' with reference to context.
2. Briefly describe a start-up you know of which has become a success story.
3. Write a note on the role and value of the customer for a start-up.
4. If you could form your own start-up, what product or service would it offer? Why? Describe what your business model would look like.
5. According to the text, why do many startups fail even before making any sales?
6. What is meant by the quotation 'Get out of the building 'in the context of this essay?
7. What does the author have to say about markets and their significance to start-ups?
8. What is the "real problem" that startups should identify before developing a product?
9. What role do customer feedback and qualitative interactions play in validating a startup's

product idea?

10. According to the text, what does the passage say about verifying assumptions with customers?

UNIT V- INTEGRITY AND PROFESSIONALISM PROFESSIONAL ETHICS

1. What is meant by professional ethics? Why is public safety considered a core value in engineering ethics?
2. What role do codes of ethics play in maintaining the integrity of a profession?
3. What is a professional dilemma, and how can engineers respond to one responsibly?
4. **Explain** what is meant by social contract with society and **illustrate your answer with examples** of professional responsibilities mentioned in the lesson “Integrity and Professionalism.
5. Using examples from the text, explain why professionalism is defined not just by competence, but by a commitment to ethical conduct. Discuss how this is crucial for maintaining public trust.
6. What is SQ3R method? Explain in detail the step-by-step process of effective study?
7. Define Report writing? What are the different types of reports commonly used in academic and professional contexts?
8. Discuss the essential elements and standard format of a well-structured report. How do these components contribute to clarity, coherence, and effective presentation of information?
9. Write a report to your professor in the Computer Science Department, detailing the progress of your project to develop a dynamic website for the university where students can view, register for, and manage campus events. Discuss the work completed, the challenges faced. If any, and the next steps you have planned.
10. Present the annual report of your college's cultural association in about 400-500 words. The report could mention its purpose, the members of its organising committee, its activities. And plans for the coming year.

ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Pre-requisites: Mathematical Knowledge at pre-university level.
Course Objectives: To learn

- Methods of solving the differential equations of first and higher order.
- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

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

- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems.
- Use the Laplace transforms techniques for solving ODE's.
- Evaluate the line, surface and volume integrals and converting them from one to another

UNIT-I: First Order ODE **8 L**

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

UNIT-II: Ordinary Differential Equations of Higher Order **10L**

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, sin ax, cos ax, polynomials in x, $e^{ax}V(x)$ and $x\mathrm{V}(x)$, method of variation of parameters.

UNIT-III: Laplace transforms **10 L**

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

UNIT-IV: Vector Differentiation **10 L**

Vector point functions and scalar point functions, Gradient, Divergence and Curl, Directional derivatives, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration **10 L**

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and CompanyLimited, New Delhi.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.

ASSIGNMENT QUESTIONS

UNIT-I

SHORT ANSWER QUESTIONS

1. Define exact differential equation.
2. Solve $ydx - xdy = a(x^2 + y^2)dx$
3. Find the integrating factor of $(x^2 + y^2)dx - 2xydy = 0$
4. Find the integrating factor of $\frac{dy}{dx} = e^{2x} + y - 1$
5. Define orthogonal trajectory.
6. Write the general form of linear differential equation in x and y terms
7. Write the general form of the Bernoulli's Equation in 'y' and 'x' terms
8. Define self-orthogonal system of family of curves
9. State Newton's law of cooling.
2. 10.State law of natural growth.

LONG ANSWER QUESTIONS

1. Solve $(x^2y^2 + xy + 1)ydx + (x^2y^2 - xy + 1)xdy$=0
2. Solve $y(xy + e^x)dx - e^x dy = 0$
3. 3.Solve $(1 + y^2)dx = (tan^{-1}y - x)dy$
4. Solve$(x + 2y^3)\frac{dy}{dx} = y$.
5. Solve $x\ logx\frac{dy}{dx} + y = 2logx$
6. 6.Solve $\frac{dy}{dx} + ytanx = y^2secx$

7. Solve $\frac{dy}{dx}(x^2y^3 + xy) = 1$

8. Find the orthogonal trajectory of the family of confocal conics $\frac{x^2}{a^2} + \frac{y^2}{a^2+\lambda} = 1$, $where\ \lambda\ is\ \ the\ parameter$

9. Prove that the system of parabolas y^2=4a(x+a) is self-orthogonal

10. Bacteria in a culture grows exponentially so that the initial number has doubled in three hours. How many times the initial number will be present after 9 hours

11. The temperature of the surrounding air is 20ºC. The temperature of a hot body reduces from 100ºC to 80ºC in 10 minutes. What will be the temperature of the body after 20 Minutes? When will be the temperature 40ºC?

12. The number N of bacteria in a culture grew at a rate proportional to N, the value of N Was initially 100 and increased to 332 in one hour. What was the value of N after 1½ hour?

13.Abody kept in air with temperature 25ºC cools from 140 ºC to 80 ºC in 20 minutes. Find when the body cools down to 35 ºC.

UNIT-II

SHORT ANSWER QUESTIONS

1. Solve $(D^2 - 3D + 4)y = 0$
2. Write the general solution of $(D^3 - D)y = 0$
3. Find the complete solution of $(D^4 + 16)y = 0$
4. Solve $(D^2 + 2D + 1)y = e^{-x}$.
5. Find the P.I of $(D^2 + 1)y = x$
6. 6.Find the P.I of $(D^2 + 2)y = e^x cosx$
7. Solve $(D^2 + 4)y = sin2x$
8. Solve $(x^2D^2 - 4xD + 6)y = 0$.
9. Define wronskian of two functions and give an example.
10. 10.Find the wronskian of two functions x^2 and $3x^2$

LONG ANSWER QUESTIONS

1. Solve $(D^3 + 2D^2 + D)y = e^{2x} + x^2 + sin2x$
2. Solve $(D^2 + 5D - 6)y = sin4x\ cosx$
3. Solve $(D^2 + 3D + 2)y = xe^x sinx$
4. Solve the differential equation $\frac{d^2y}{dx^2} - 4\frac{dy}{dx}$ + 4y = $8e^{2x}$ sin $2x$.
5. Solve$(D^2 - 1)y = xsinx$

6 Solve $(D^2 + 4D + 3)y = e^x cos2x - sin3x$

7. Solve $(D^2 - 2D - 3)y = x^3 e^{-3x}$

8. Solve by the method of variation of parameters$(D^2 + 1)y = sec$x

9. Solve $(D^2 + 4)y = tan2x$ by variation of parameters.

10. Solve by the method of variation of parameters$(D^2 + a^2)y = cosecax$

UNIT-III

SHORT ANSWER QUESTIONS

1. Define Laplace transformation and give an example.
2. What is the existence condition of Laplace transform?
3. Find L$\{e^{-2t}\ (4cos3t + sin2t)\}$
4. Find L$\{t\ sinat\}$
5. Find L$\left\{\frac{e^{-at} - e^{-bt}}{t}\right\}$
6. State first shifting theorem of Laplace transform.
7. State convolution theorem.
8. Define Unit step functionfind its Laplace transform.
9. Find $L^{-1}\left\{\frac{s+a}{s^2+a^2}\right\}$
10. Find $L^{-1}\left\{\frac{2s+12}{(s^2+6s+13)^2}\right\}$

LONG ANSWER QUESTIONS

1. Find the Laplace transform of $f(t) = \begin{cases} cost & 0 < t < \pi \\ sint & t > \pi \end{cases}$
2. Find (i) L$\{\ t\ e^{-2t}\ Sin3t\}$ (ii) L$\{t^2 e^{-3t}\ Cost\}$.
3. Find (i) L$\left\{\int_0^t te^{-2t} Sin2t\ dt\right\}$ (ii) $L\left\{\int_0^t \frac{e^{-t}Sint}{t}\ dt\right\}$
4. Using Laplace transform evaluate $(i)\int_0^\infty t^2 e^{-4t} sin2t\ dt$ (ii) $\int_0^\infty \frac{e^{-t}sin^2 t}{t}\ dt.$
5. Find (i) $L^{-1}\left\{\frac{s^2}{(s^2+4)(s^2+9)}\right\}$ (ii) $L^{-1}\left\{\frac{s^2}{(s^2+4a^4)}\right\}$ (iii) $L^{-1}\left\{\frac{2s^2-6s+5}{s^3-6s^2+11s-6}\right\}$
6. Find (i) $L^{-1}\left\{\ log\frac{(s^2+b^2)}{(s^2+a^2)}\right\}$ (ii)$L^{-1}\left\{tan^{-1}\frac{a}{s} + cot^{-1}\frac{s}{b}\right\}$
7. Use convolution theorem to find (i) $L^{-1}\left\{\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right\}$ (ii) $L^{-1}\left\{\frac{s}{(s^2+4)^2}\right\}$
8. Using Laplace transform solve the following differential equation

   $\frac{d^2y}{dt^2} - 6\frac{dy}{dt} + 9y = t^2 e^{3t}$; given that y (0) =2 $y'(0)$=6

9. Using Laplace transform solve the following D.E $\frac{d^2x}{dt^2} + 2\frac{dx}{dt} + 5x = e^{-t}$sint; given that $x(0) = 0,\ x'(0) = 1$

10. Using Laplace transform solve the following differential equation$(D^2 + 9)$y = cos2t;

given that $y(0) = 1,\ y\left(\frac{\pi}{2}\right) = -1$

11. Using Laplace transform solve the following D.E $y'' - 3y' + 2y = 4t + e^{3t}$; given that $y(0) = 1,\ y'(0) = 1$

UNIT-IV

SHORT ANSWER QUESTIONS

1. Find $\nabla(x^2 - yz + z^2)$.

2. Find a unit normal vector to the surface $z = x^2 + y^2$ at $(-1, -2,5)$.

3. If $\bar{a}$ is constant vector then prove that grad $(\bar{a} \cdot \bar{r}) = \bar{a}$.

4. Find the greatest value of the directional derivative of the function $\emptyset = x^2yz^3$ at (2,1,-1)

5. Find div $\bar{f}$ when $\bar{f} =$ grad $(x^3 + y^3 + z^3 - 3xyz)$.

6. Define directional derivative.

7. Prove that div curl$\bar{f} = 0$.

8. Define Irrotational vector.

9. Define Solenoidal vector.

10. If $\bar{F} = y(ax^2 + z)\bar{\imath} + x(y^2 - z^2)\bar{\jmath} + 2xy(z - xy)\bar{k}$ is solenoidal then find a.

LONG ANSWER QUESTIONS

1. Find the directional derivative of $\phi = \mathrm{x}y^2 + \mathrm{y}z^3$ at $(2, -1,1)$ in the direction of $(i + 2j + 2k)$.

2. Find the directional derivative of $\phi(x, y, z) = x^2yz + 4xz^2$ at the point $(1, -2, -1)$ in the direction of the normal to the surface $f(x, y, z) = x\log\ z - y^2$at $(-1,2,1)$.

3.Find the directional derivative of the function $f = x^2 - y^2 + 2z^2$ at the point P=(1,2,3) in the direction of the line PQ where Q=(5,0,4)

4. Find the angle between the normal to the surface $xy = z^2$ at the points $(4,1,2)$ and $(3,3, -3)$.

5. Find the value of a and b so that the surfaces $ax^2 - byz = (a + 2)x$ and $4x^2y + z^3 = 4$ may intersect orthogonally at the point$(1, -1,2)$.

6. Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^3 + y^3 - 3$ at the Point$(2, -1,2)$.

7. Prove that $\bar{F} = 2xy\sin\ z\bar{\imath} + x^2\sin\ z\bar{\jmath} + x^2y\cos\ z\bar{k}$ is irrotional and find its scalar Potential.

8. Find constants a, b, c so that the vectors $\bar{A} = (x + 2y + az)\bar{\imath} + (bx - 3y - z)\bar{\jmath} + (4x + cy + 2z)\bar{k}$ is Irrotational. Also find ϕ such that $\bar{A} = \nabla\phi$.

9. Prove that div (grad r^{m}) = m (m+1)$r^{\mathrm{m-2}}$
10. Show that $\nabla^2[f(r)] = f''(r) + \frac{2}{r}f'(r)$where $r = |\vec{r}|$.

UNIT-V

SHORT ANSWER QUESTIONS

1. State Gauss divergence theorem.
2. State Green's theorem.
3. State Stroke's theorem.
4. If $\bar{F} = (4xy - 3x^2z^2)i + 2x^2j - 2x^3zk$ prove that work done is independent of the Curve joining two points.
5. Evaluate $\int_c \bar{F}\,.\,d\bar{r}$ where $\bar{F}$=$x^2i + y^2j$ and the curve $y = x^2$ in the xy-plane from (0, 0) to (1, 1)
6. Define Conservative field.

LONG ANSWER QUESTIONS

1. Evaluate$\int_c \bar{F}\,.\,d\bar{r}$ where $\bar{F} = (5xy - 6x^2)i + (2y - 4x)j$ and the curve $y = x^3$ in the xy-plane from (1, 1) to (2, 8)
2. Find the work done by the force $\bar{F} = (2y + 3)i + xzj + (yz - x)k$ when it moves a Particle from the point (0,0,0) to (2,1,1) along the curve $x = 2t^2, y = t, and\ z = t^3$.
3. If $\bar{F} = (x^2 + y^2)i - 2xyj$ evaluate $\int_c \bar{F}\,.\,d\bar{r}$ where 'c' is the rectangle in xy- plane bounded by $y = 0, y = b, x = 0, x = a$
4. Evaluate $\int \bar{F}\,.\,\bar{n}ds$ where $\bar{F} = zi + xj - 3y^2zk$ and 'S' is the surface $x^2 + y^2 = 16$ included in the first octant between $z = 0\ and\ z = 5$.
5. If $\bar{F} = 4xzi - y^2j + yzk$ evaluate $\int_s$ where 'S' is the surface of the cube bounded by $x = 0, x = a, y = o, y = a\ and z = 0, z = a$

6. If $\bar{F} = (2x^2 - 3z)i - 2xyj - 4xk$ then evaluate $(i)\int_v (\nabla.\bar{F})dv$ and (ii)$\int_v (\nabla X\bar{F})dv$ where 'v' is the closed region bounded by $x = 0, y = 0, z = 0, 2x + 2y + z = 4$.
7. Use Divergence theorem to evaluate $\iint (xi + yj + z^2k).\bar{n}ds$ where 'S' is the surface bounded by the cone $x^2 + y^2 = z^2$ in the plane $z = 4$.
8. Verify Gauss divergence theorem for $\bar{F} = x^2i + y^2j + z^2k$, over the cube bounded by the planes $x = 0,\ x = a,\ y = 0,\ y = a\ and\ z = 0,\ z = a$.
9. Using Green's theorem, evaluate$\int_c (2xy - x^2)dx + (x^2 + y^2)dy$, where 'C' is the closed curve of the region bounded by $y = x^2$ and$y^2 = x$.
10. Verify Green's theorem in the plane for $\oint (x^2 - xy^3)dx + (y^2 - 2xy)dy$ where C is the square with vertices (0,0), (2,0), (2,2) and (0,2).
11. Evaluate by Stoke's theorem $\int_c (e^x dx + 2ydy - dz)$ where 'C' is the curve $x^2 + y^2 = 9$ and $z = 2$.
12. Verify Stoke's theorem for $\bar{F} = y^2i - 2xyj$ taken round the rectangular bounded by $x = \pm b, y = 0, y = a$.

ADVANCED ENGINEERING PHYSICS

Course Objectives:

1. To study crystal structures, defects, and material characterization techniques like XRD and SEM.
2. To understand fundamental concepts of quantum mechanics and their applications in solids and nano materials.
3. To learn the properties and applications of magnetic and dielectric materials.
4. To explore the working and applications of lasers and fibre optics in modern technology.
5. To introduce quantum computing principles, Classical bits, qubits and quantum gates.

Course Outcomes:

1. **CO1**: Analyze crystal structures, identify defects, and apply XRD and SEM techniques for material characterization.
2. **CO2**: Apply quantum mechanical principles to explain particle behavior and energy band formation in solids.
3. **CO3**: Classify dielectric and magnetic materials and explain their properties, synthesis, and applications.
4. **CO4**: Explain the principles of lasers and fibre optics and their applications in communication and sensing.
5. **CO5**: Understand quantum computing concepts, Classical bits and qubits, Single and multiple qubits and quantum gates.

UNIT-I: Crystallography & Materials Characterization [12]

Introduction: Unit cell, space lattice, basis, lattice parameters; crystal structures, Bravais lattices, packing factor: SC, BCC, FCC; Miller indices, inter-planar distance; defects in crystals (Qualitative): point defects, line defects, surface defects and volume defects. concept of nano materials: surface area to volume ratio, X-ray diffraction: Bragg's law, Debye Scherrer's formula for crystallite size(qualitative), scanning electron microscopy (SEM): block diagram, working principle.

UNIT-II : Quantum Mechanics [13]

Introduction, de-Broglie hypothesis, Heisenberg uncertainty principle, physical significance of wave function, postulates of quantum mechanics: operators in quantum mechanics, eigen values and eigen functions; Schrödinger's time independent wave equation, particle in a 1D box, Bloch's theorem (qualitative), Kronig-Penney model (qualitative): E-k diagram, formation of energy bands, origin of band gap, classification of solids, concept of discrete energy levels and quantum confinement in nano materials.

UNIT-III: Dielectric and magnetic materials [10]

Introduction to dielectric materials, types of polarization: Expressions of electronic and ionic polarizations: orientation polarization(qualitative):; ferroelectric, piezoelectric, pyro electric materials and their applications.

Introduction to magnetic materials, origin of magnetic moment-classification of magnetic materials, hysteresis, Weiss domain theory of ferromagnetism, soft and hard magnetic materials, applications. magnets for EV, Giant Magneto Resistance (GMR) device.

UNIT-IV: Laser and Fibre Optics **[13]**

Introduction to laser, characteristics of laser, Einstein coefficients and their relations, metastable state, population inversion, pumping, lasing action, Ruby laser, He-Ne laser, semiconductor diode laser, applications of lasers.

Introduction to fibre optics, total internal reflection, construction of optical fibre, acceptance angle, numerical aperture, classification of optical fibres, losses in optical fibre, optical fibre for communication system, applications.

UNIT-V: Quantum Computing **[12]**

Introduction, linear algebra for quantum computation, Dirac's Bra and Ket notation and their properties, Hilbert space, Bloch's sphere, concept of quantum computer, classical bits, Qubits, multiple Qubit system, entanglement, quantum gates (any two), quantum computing system for information processing& evolution (qualitative), challenges and advantages of quantum computing over classical computation.

TEXT BOOKS:

1. Walte Borchardt-Ott, *Crystallography: An Introduction*, Springer.
2. Charles Kittel, *Introduction to Solid State Physics*, JohnWiley & Sons, Inc.
3. Thomas G.Wong, *Introduction to Classical and Quantum Computing*, Rooted Grove

REFERENCE BOOKS:

1. Jozef Gruska,*Quantum Computing*, McGrawHill
2. Michael A.Nielsen & IsaacL.Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press.
3. John M. Senior, *Optical Fiber Communications Principles and Practice*, Pearson Education Limited.

Useful Links

- https://shijuinpallotti.wordpress.com/wp-content/uploads/2019/07/optical-fiber- communications-principles-and-pr.pdf
- https://www.geokniga.org/bookfiles/geokniga-crystallography_0.pdf
- https://dpbck.ac.in/wp-content/uploads/2022/10/Introduction-to-Solid-State-PhysicsCharles- Kittel.pdf
- https://www.thomaswong.net/introduction-to-classical-and-quantum-computing-1e4p.pdf
- https://www.fi.muni.cz/usr/gruska/qbook1.pdf
- https://profmcruz.wordpress.com/wp-content/uploads/2017/08/quantum-computation-and- quantum-information-nielsen-chuang.pdf

ASSIGNMENT QUESTIONS

UNIT: I
Crystallography & Materials Characterization

1. Describe the seven crystal systems with diagrams.
2. Describe 14 Bravais lattice with neat diagrams.
3. Define basis, space lattice, unit cell & lattice parameters.
4. Show that F.C.C. is most closely packed than the simple cubic and body centered cubic.
5. What are Miller Indices? How are they obtained?
   Sketch the following planes in a simple cubic structure (100), (110), and (111)
6. Deduce the expression for the inter planer spacing in terms of Miller Indices in case of cubic crystal.
7. State and Explain the Bragg's law of X ray diffraction.
8. Calculate the glancing angle of (1 1 1) plane of cubic crystal having axial length $1.5A^0$ corresponding to second order diffraction maximum for X-rays of wavelength 0.058nm.
9. Write a brief note on defects in crystals.
10. a) Write notes on Line defects in crystals.
    b) Explain Burger's vector.
11. Explain the surface area to volume ratio in nanomaterials.
12. Explain in detail about the characterization of nano particles by using SEM.

UNIT: II
Quantum Mechanics

1. a) Explain the de -Broglie hypothesis. Derive the equation for de-Broglie Wavelength and write the properties of matter waves.
2. a) Define Heisenberg uncertainty principle.
   b) Write a short note on Eigen values and Eigen functions.
3. a) Deduce the 1-Dimensional Schrodinger's time independent wave equation for an electron.
   b) Explain the physical significance of wave equation.
4. a) Derive the expressions for the energy and wave function for a particle moving in one-dimensional potential box.
   b) Find the lowest energy of an electron confined in a box of side 0.1nm each.
5. Define Bloch's theorem and explain Kronig-Penney model.
6. Describe the postulates of quantum mechanics.
7. Draw E-k diagram and explain Brillouin's zones.
8. Explain the formation of energy band and origin of band gap.
9. Write a note on quantum confinement of nano materials.
10. Describe the operators in quantum mechanics.
11. a) Obtain the expression for the de Broglie wavelength associated with electron.
    b) Calculate the wavelength associated with an electron accelerated by a potential of 50V.
12. Write a note on the classification of materials on the basis of energy bands.

UNIT: III
Dielectric and Magnetic Materials

1. Define Electric dipole, dipole moment and dielectric constant, electric polarizability, electric susceptibility.
2. Explain various polarization mechanisms in dielectrics
3. Derive the expression for electronic polarizability and ionic polarizability.
4. Write a short note on ferroelectricity and Piezoelectricity and Pyroelectricity.
5. Explain Hysteresis loop of ferroelectric materials.
6. Define Magnetic field induction, magnetic field intensity, Magnetic permeability, Magnetization & Magnetic susceptibility.
7. Classify the magnetic materials based on atomic point of view and write their properties.
8. Describe the Hysteresis loop of ferromagnetism. How can it be used to distinguish between hard and soft magnetic materials?
9. Explain the Domain theory of ferromagnetism.
10. Mention the applications of magnetic materials.
11. Why do electric vehicles use magnets in their motors?
12. How do magnets help in the working of GMR devices used in data storage and sensors?

UNIT: IV
Laser and Fiber Optics

1. Discuss about the characteristics of Lasers?
2. Define and derive the relation between the probabilities of spontaneous emission and stimulated emission in terms of Einstein's coefficients?
3. Describe construction and working principle of Ruby Lasing system?
4. Describe construction and working principle of He-Ne laser?
5. Describe construction and working principle of semiconductor Laser diode?
6. Distinguish spontaneous and stimulated emissions of radiation.
7. What is population inversion? Discuss different methods of pumping.
8. Derive an expression for Numerical Aperture and acceptance angle of an optical fiber?
9. Discuss the light propagation in step index and graded index optical fibers?
10. Explain how optical fiber communication system works along with few applications?
11. a) Write a note on the principle of optical fiber.
    b) Mention the applications of optical fiber.
12. a) Write a note on the principle of laser.
    b) Mention the applications of laser.

UNIT: V
Quantum Computing

1. Explain the importance of linear algebra in quantum computation with relevant examples.
2. Describe Dirac's Bra and Ket notation. Illustrate their mathematical properties and discuss their significance in representing quantum states.
3. Define Hilbert space and its importance in quantum computation. Mention its key features and characteristics.
4. Using a diagram, explain the Bloch sphere representation of a single qubit.
5. Compare and contrast classical bits and quantum bits (qubits).

6. Explain XOR, NAND and NOR gates along with their truth tables.
7. Explain the phenomenon of quantum entanglement. Provide an example of an entangled state and discuss its significance in quantum information processing.
8. What is single qubit gate? Discuss the operation of Pauli-X and Pauli-Y on qubit with truth tables.
9. Explain inner and outer products using Dirac notation.
10. Write a note on evolution of quantum computing system. Discuss about quantum information processing and write its limitations.
11. Explain the advantages and challenges of quantum computing. Consider issues such as decoherence and error correction.
12. Mention few applications of quantum computing.

ELECTRONIC DEVICES AND CIRCUITS

Course Objectives:

1. To understand the working and operation of semi conductor diodes with its V-I characteristics.
2. To implement the diodes in various applications.
3. To study the operation, configurations of BJT and understand the need of biasing in amplifiers.
4. To study the operation, configuration of FET.
5. To study the structure, working and characteristics of special purpose devices.

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

CO1: Analyze the operation and V-I characteristics of semiconductor diodes.

CO2: Apply the diodes in rectifiers, clippers and clamping circuits.

CO3: Evaluate the operation and configuration of Bipolar Junction Transistors (BJTs) and design appropriate biasing networks for BJTs

CO4:.Analyse the operation and configuration of FETs.

CO5: Analyze the structure, working, and characteristics of JFETs, MOSFETs, and advanced devices like FinFETs and CNTFETs, and compare modern device technologies.

UNIT - I:

Diode Characteristics: PN junction diode – I-V characteristics, Diode resistance and capacitance, Diode models (Ideal, Simplified, Piecewise Linear), Diode as a switch, Zener diode – I-V characteristics and voltage regulation.

UNIT - II:

Diode Applications

Rectifiers – Half-Wave Rectifier, Full-Wave Rectifier (Center-tap and bridge), Capacitor and Inducter filters for rectifiers, Clippers-Clipping at two independent levels. Clampers-Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

UNIT - III:

Bipolar Junction Transistor (BJT): Structure and working principle of BJT, Current components and transistor action, Configurations: Common Base (CB), Common Emitter (CE), Common Collector (CC), Input and output characteristics,

BJT Biasing: Need for biasing and stabilization, Load line and operating point, Biasing techniques: Fixed bias, Collector-to-base bias, Voltage divider bias, Stability factors and thermal runaway

UNIT - IV:

Field Effect Transistors (FET), JFET: Structure, operation, and characteristics, MOSFET: Enhancement and Depletion modes — Structure, operation, and configuration, Common Source (CS), Common Gate (CG), and Common Drain (CD) Characteristics.

UNIT - V:

Special Purpose Devices: Principle of Operation of — SCR, Tunnel Diode, Varactor Diode, Photo Diode, Solar Cell, LED and Schottky Diode

Advance Devices: FinFETs-3D Structure, Scalling advantages, CNTFETs-Structure balastic transport, fabrication, comparison: CMOS vs FinFET vs CNTFET.

TEXT BOOKS:

1. Millman, Jacob, and Christos C. Halkias. *Electronic Devices and Circuits*. Tata McGraw-Hill, 1991.
2. Boylestad, Robert L., and Louis Nashelsky. *Electronic Devices and Circuit Theory*. Pearson, 11th ed., 2013.
3. Sedra, Adel S., and Kenneth C. Smith. *Microelectronic Circuits*. Oxford University Press, 7th ed., 2014.

REFERENCE BOOKS:

1. Bell, David A. *Electronic Devices and Circuits*. Oxford University Press, 5th ed., 2008.
2. Neamen, Donald A. *Electronic Circuit Analysis and Design*. McGraw-Hill, 2nd ed., 2001.
3. Salivahanan, S., and N. Suresh Kumar. *Electronic Devices and Circuits*. McGraw-Hill Education, 4th ed., 2017.
4. Razavi, Behzad. *Fundamentals of Microelectronics*. Wiley, 2nd ed., 2013.
5. Taur, Yuan, and Tak H. Ning. *Fundamentals of Modern VLSI Devices*. Cambridge University Press, 2nd ed., 2009.

ASSIGNMENT QUESTIONS

UNIT – I

1. Write about Diode Equivalent Circuits.
2. With the help of neat diagram explain about PN junction diode.
3. Define the following:
   a) static resistance of a diode
   b) dynamic resistance of a diode
   c) diffusion capacitance
   d) transition capacitance
   e) reverse saturation current of diode
4. a) State the diode current equation and mention each term in formula.
   b) Explain briefly about Zener diode and its V-I characteristics.
5. Calculate the forward bias current of a Si diode when forward bias voltage of 0.4V is applied, the reverse saturation current is 1.17×10-9A and the thermal voltage is 25.2mV.
6. Explain about forward bias using V-I characteristics of a PN Junction diode.
7. With the help of V-I characteristics curve, explain about reverse bias of a PN Junction diode.
8. Explain about diode as a Switch.
9. Explain in detail about Zener diode as voltage regulator.
10. Write the importance of reverse breakdown region in Zener Diode.

UNIT - II

1. Draw circuit diagram and operation waveform for the following:
   a) positive series clipper with reference voltage
   b) Negative shunt clipper without reference voltage
   c) positive shunt clamper without reference voltage
   d) negative shunt clamper with reference voltage
2. Explain the operation of full-wave rectifier and describe the necessary parameters.
3. With neat sketch, describe the operation of capacitive filter and discuss the necessary parameters.
4. A 16:1 transformer with an input voltage of 230v,50Hz is coupled to a Half wave rectifier circuit with a load resistance of 1KΩ. Estimate i) Efficiency & ii) Ripple factor
5. Draw and explain the operation of double-sided clipper?
6. State and Prove Clamping Circuit Theorem.
7. Compare half wave, full wave and bridge rectifier.
8. Explain about center-tapped rectifier.
9. Derive parameters for half wave and full wave rectifier.
10. Define the following terms:
    (a) efficiency
    (b) ripple factor
    (c) form factor

UNIT – III

1. Illustrate the Construction & Operation of NPN transistor.
2. Explain about input & output characteristics of Common Base configuration.
3. (a) Write the comparisons between CB, CE, CC configurations.
   (b) Derive the relation between α, β and γ.
4. Explain how transistor acts as a Switch.
5. Explain about input & output characteristics of Common Emitter configuration.
6. Discuss about Transistor switching times.
7. Explain about input & output characteristics of Common Collector configuration.
8. Write the characteristics of Emiter, Base and Collector.
9. Illustrate the Construction & Operation of PNP transistor.

10. What are various biasing techniques. Explain in detail.
11. Write the importance of biasing and define stabilization.
12. Define the following with relevant equations:
    (a) stability factor, S
    (b) stability factor, S'
    (c) stability factor, S"

UNIT – IV

1. What are the V-I characteristics of n-channel JFET.
2. Explain the Construction and Operation of n-Channel depletion type MOSFETs.
3. Give the Comparison of BJT and FET.
4. Explain how the FET can act as Voltage Variable Resistor.
5. Explain how the MOSTET as a capacitor.
6. Justify why FET is a voltage controlled device.
7. Explain the Construction and Operation of enhancement MOSFET with neat diagrams.
8. Explain the characteristics of common drain configuration.
9. Briefly describe about the characteristics of common source configuration.
10. With the help of characteristics, write about common gate configuration.

UNIT – V

1. Explain the operation of Tunnel diode with its V-I Characteristics.
2. Discuss the construction and Operation of LED.
3. Explain the operation of UJT and draw its V-I characteristics.
4. Explain how Zener diode act as voltage regulator.
5. Explain the Construction, Operation of SCR. Also draw the V-I characteristics.
6. Explain the operation of Photo diode.
7. Write about Schottky and Varactor diode.
8. Write few lines about FinFETs.
9. Describe about CNTFET.
10. Write scaling advantages of FINFETS.
11. Illustrate the comparisons between CMOS, FINFETS and CNTFET.

DATA STRUCTURES

Prerequisites: A course on "Programming for Problem Solving

Course Objectives

1. To introduce the fundamental concepts, terminology and classifications of data structures.
2. To provide knowledge of linear data structures such as lists, stacks and queues along with their applications.
3. To impart understanding of non-linear data structures such as trees, search trees, heaps, tries and graphs.
4. To familiarize students with various algorithms for sorting, searching and pattern matching.
5. To develop an understanding of hashing techniques, collision resolution strategies and file organization method for efficient data management.

Course Outcomes: Students are able to

1. Understand and implement basic linear data structures like linked lists, stacks and queues.
2. Construct and manipulate various trees, including binary search and balanced trees, applying traversal and balancing techniques.
3. Analyse and implement multi-way search trees and heaps, applying efficient search algorithms.
4. Represent graphs, perform graph traversals, and apply advanced sorting algorithms.
5. Implement hashing techniques, handle collisions, and understand file organization and indexing methods.

UNIT – I

Introduction to Data Structures: Basic Terminology, Classification of Data Structures, Operation on Data Structures, abstract data types, selecting a Data Structure, Linear list — Introduction, singly linked list, Circular Linked Lists, Doubly Linked List, Stacks- Operations, Stack algorithm, Stack ADT, Stack applications, Queues- operations, Queue Algorithm, Queue ADT, Queue Applications.

UNIT - II

Trees: Introduction, Types of Trees, creating a Binary Tree from a General Tree, traversing a Binary Tree, Binary Search Trees (BST), BST Operations- Searching, Insertion and Deletion, BST ADT, BST Applications, Threaded Binary Trees, AVL Trees, Red –Black Trees, Splay Trees

UNIT – III

Pattern Matching and Tries: Pattern matching algorithms-Brute force, the Boyer-Moore algorithm, the Knuth-Morris-Pratt algorithm, Standard Tries, Compressed Tries, Suffix tries.

UNIT - IV

Graphs: Introduction, Directed Graphs, Bi-connected Components, Representation of Graphs, Graph Traversal Algorithms, Graph ADT, Applications of Graphs

Sorting: Radix Sort, Heap sort, Shell Sort, Tree Sort,

UNIT – V

Hashing and Collision: Introduction, Hash Tables, Hash Functions, Different Hash Functions: Division Method, Multiplication Method, Mid-square Method, Folding Method; collisions: Collision Resolution by Open Addressing, Collision Resolution by Chaining Files and their Organization: Introduction, Data hierarchy, File Attributes, Text and Binary Files, Basic File Operations, File Organization, Indexing

TEXTBOOKS:

1. Data Structures: A Pseudocode Approach with C, R. F. Gilberg and B.A.Forouzan, 2nd Edition, Cengage Learning
2. Data Structure using C– Reema Thareja, 3rd Edition, Oxford University Press.

REFERENCE:

1. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

PYTHON PROGRAMMING

Prerequisites: Basic knowledge of computer fundamentals, C programming.

Course Objectives:

Introduce the fundamentals of Python programming for problem-solving.

1. Develop skills to write structured, modular, and efficient Python code.
2. Enable students to use Python's built-in data structures and libraries effectively.
3. Provide knowledge on file handling, exception handling, and object-oriented programming in Python.
4. Equip students with the ability to apply Python for real-world applications including data processing and automation.
5. To introduce the principles of object-oriented programming in Python and demonstrate their use in developing real-world applications.

Course Outcomes: Students are able to:

1. Write Python programs using variables, operators, expressions, and control structures.
2. Implement Python programs using built-in data structures like lists, tuples, sets, and dictionaries.
3. Apply modular and object-oriented programming principles in Python.
4. Handle files, exceptions, and apply Python libraries for problem-solving.
5. Develop small-scale applications in Python for automation and data manipulation.

UNIT-1 – Introduction to Python and Basics of Programming

Introduction to Python: Features, Applications, Installation, IDEs, Python Syntax, Indentation, Comments, Variables, Data Types, Type Casting, Operators: Arithmetic, Relational, Logical, Assignment, Membership, Identity, Bitwise, Input/Output functions (input(), print()), Control Structures: if, if-else, if-elif-else, Nested Conditions, Looping: for, while, Nested Loops, break, continue, pass.

UNIT-2 – Data Structures in Python

Strings: Creation, Indexing, Slicing, Methods, String Formatting, Lists: Creation, Indexing, Slicing, List Comprehension, Methods, Tuples: Properties, Indexing, Methods, Sets: Creation, Operations, Methods, Dictionaries: Creation, Access, Methods, Dictionary Comprehension, Iterating over data structures.

UNIT-3 – Functions and Modules

Functions: Defining, Calling, Parameters, Return Values, Types of Arguments: Positional, Keyword, Default, Variable Length, Scope of Variables: Local and Global, Lambda Functions, Map, Filter, Reduce, Recursion in Python, Modules: Importing, Creating User-defined Modules, Standard Modules (math, random, datetime), Packages in Python.

UNIT-4 – File Handling and Exception Handling

File Handling: Opening, Reading, Writing, Appending, File Modes, File Methods, Working with CSV and JSON Files, Exception Handling: try, except, else, finally, Built-in Exceptions, Raising Exceptions, Introduction to Regular Expressions (re module).

UNIT-5 – Object-Oriented Programming and Applications

OOP Basics: Classes, Objects, Attributes, Methods, Constructor (__init__), self keyword, Inheritance: Single, Multiple, Multilevel, Hierarchical, Method Overriding, Method Overloading (conceptual), Encapsulation and Polymorphism, Application Development: Data Processing Script, Basic Calculator, File Organizer, Simple Data Analysis with pandas.

TEXT BOOKS:

1. Python Programming: Using Problem Solving Approach by Reema Thareja.
2. Python Crash Course by Eric Matthes, Learning Python by Mark Lutz.

REFERENCE BOOKS:

1. Introduction to Python Programming by Gowrishankar S., Veena A.
2. Python Cookbook by David Beazley and Brian K. Jones.
3. Fluent Python by Luciano Ramalho, Automate the Boring Stuff with Python by Al Sweigart.

NETWORK ANALYSIS AND SYNTHESIS

Course Objectives:

1. To identify the behavior of electric and magnetic networks.
2. To analyse transient and study state responses of combined passive elements.
3. To examine two port networks using various parameters.
4. Design and construct different of filter networks and attenuators.
5. Evaluate transfer function of passive elements for network synthesis.

Course Outcomes: Upon successful completion of the course, students will be able to:
CO1: Identify the behavior of electric and magnetic networks.
CO2: Analyse transient and study state responses of combined passive elements.
CO3: Examine two port networks using various parameters.
CO4: Construct various filter networks and attenuators.
CO5: Inspect transfer functions of passive elements for network systhesis.

UNIT - I

Network Topology: Basic cutset and tie set matrices for planar networks, Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

UNIT - II

Transient and Steady state analysis: RC, RL and RLC Circuits, Sinusoidal, Step and Square responses. RC Circuits as integrator and differentiators. 2^{nd} order series and parallel RLC Circuits, Root locus, damping factor, over damped, under damped, critically damped cases, quality factor and bandwidth for series and parallel resonance, resonance curves.

UNIT - III

Two port network parameters: Z, Y, ABCD, h and g parameters, Characteristic impedance, Image transfer constant, image and iterative impedance, network function, driving point and transfer functions — using transformed (S) variables, Poles and Zeros. Standard T, π, L Sections, Characteristic impedance, image transfer constants, Design of Attenuators, impedance matching network.

UNIT-IV

Filters: Classification of Filters, Filter Networks, Constant-K Filters-Low pass, high pass, Band pass, band-stop filters, M-derived Filters- T and π filters- Low pass, high pass

Attenuators: Types — T, π , L, Bridge T and lattice ,Asymmetrical Attenuators T, π , L Equalizers- Types- Series, Shunt, Constant resistance, bridge T attenuation, bridge T phase, Lattice attenuation, lattice Phase equalizers

UNIT – V

Network Synthesis: Driving point impedance and admittance, transfer impedance and admittance, network functions of Ladder and non ladder networks, Poles, Zeros analysis of network functions**,** Hurwitz polynomials, Positive Real Functions, synthesis of LC, RC and RL Functions by foster and causer methods.

TEXT BOOKS:

1. Van Valkenburg -Network Analysis, 3rd Ed., Pearson, 216.
2. JD Ryder - Networks, Lines and Fields, 2nd Ed., PHI, 1999.

REFERENCE BOOKS:

1. J. Edminister and M. Nahvi - Electric Circuits, Schaum's Outlines, Mc Graw Hills Education, 1999.
2. A. Sudhakar and Shyammohan S Palli - Networks & Circuits, 4th Ed., Tata McGraw- Hill Publications
3. William Hayt and Jack E. Kimmerley - Engineering Circuit Analysis, 6th Ed., William Hayt and Jack E. Kimmerley, McGraw Hill Company

BUILDING PLANNING AND CONSTRUCTION

Course Objectives: This course is expected to enable the student to:

- Provide fundamental knowledge about buildings and the influence of climate, orientation, and landscaping on building planning and design.
- Impart understanding of planning principles
- Familiarize students with the National Building Code (NBC), its structure and guidelines for residential buildings,
- Develop knowledge of key building components
- Introduce various finishing works and temporary structures

Course Outcomes: Upon completion of this course, student should be able to

- Understand the classification of buildings, criteria for site selection, the impact of climate on building design, and the role of orientation and landscaping in planning.
- Apply the principles of planning and interpret building bye-laws to design functionally efficient, economical, and regulation-compliant buildings.
- Interpret and implement provisions of the National Building Code (NBC) related to residential buildings and understand basic construction techniques including foundations and masonry.
- Identify and analyze various types of floors, roofs, staircases, doors, windows, and lintels used in building construction and their suitability for different design conditions.
- Demonstrate knowledge of finishing works such as plastering, pointing, and floor finishes, and explain the types, design, and safety aspects of scaffolding, formwork, and centering.

UNIT - I

Fundamentals of Buildings: Building, Classification of buildings, Site selection for Residential buildings, Climate and its influence on building planning; Elements of Climate, Climatic Zone of India, Climate and comfort, Earth and its motion, Directions and their characteristics, Landscaping.

Orientation of buildings; orientation, Factors affecting orientation, Sun, Wind, Rain, CBRT suggestions orientation criteria for Indian conditions.

UNIT - II

Principles of planning and Bye Laws of buildings: Aspects, prospect, Privacy, Furniture Requirements, Roominess, Grouping, Circulation, Elegance, Economy, Practical consideration.

Buildings bye Laws; Introduction, Objective, Principles, Applicability of building bye Laws. Introduction to National building code, Objectives, Scope, Structure of NBC. General Building Requirements, Guidelines for Residential Buildings. Building Heights, Setbacks, FAR/FSI. Open Spaces, room sizes, Lighting and Ventilation, Means of Access and service ducts. Classification of buildings for fire safety.

UNIT - III

Introduction to building construction and site preparation; components of Building, **Foundations:** Functions & Requirements**, Types of Shallow Foundations:** isolated footings, combined footings, strap footings, wall footings, raft foundations, **Types of Deep Foundations:** driven piles (timber, precast concrete, steel), bored cast-in-situ piles. Brick masonry – types – bonds; Stone masonry – types

UNIT - IV

Floors, Roofs, Stairs, Doors, Windows:

Types of floors – Ground and upper floors – Brick flooring, Cement concrete flooring, Stone flooring, Tiled flooring, Types of roofs – Flat, Pitched, Sloped, Curved roofs Components and classification of staircases – Straight flight, Dog-legged, Open well, Spiral staircases –Types of doors – Panelled, Flush,

Glass, PVC, Aluminum, Steel, Sliding, Revolving, Collapsible, and Rolling shutter doors – Door frame materials and fittings. Types of windows

UNIT - V

Finishing Works:

Plastering – Purpose, types, tools and techniques – Defects in plastering. Pointing – Types and application areas – Differences between plastering and pointing.

Scaffolding, Formwork, and Centering:

Scaffolding – Definition, purpose, components – Types: Single, Double, Cantilever, Suspended, Trestle, Steel and patented scaffolds – Safety considerations. Formwork – Functions, materials (timber, steel, aluminum, plastic), formwork for slabs, beams, columns, and walls – Centering: Definition and role in arches and domes.

TEXT BOOKS:

1. Benny Raphael (2022) Building Automation from Concepts to Implementation Routledge Publications.
2. Kumara Swamy N. and Kaneswaran Rao A., *Building Planning and Drawing*, Charotar Publishing House, Revised Edition, 2020.
3. B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, *Building Construction*, Laxmi Publications, 11th Edition, 2022.
4. S.S. Bhavikatti, *Building Materials and Construction*, Vikas Publishing House, 4th Edition, 2020.

REFERENCE BOOKS:

1. Sushil Kumar, *Building Construction*, Standard Publishers Distributors, 21st Edition, 2022.
2. Bindu Balan and R. Sathish Kumar, *Climatology and Building Design*, McGraw Hill Education, 1st Edition, 2020.
3. Gurcharan Singh, *Building Planning, Designing and Scheduling*, Standard Book House, 6th Edition, 2019.
4. Rangwala S.C., *Building Construction*, Charotar Publishing House, 33rd Edition, 2021.
5. M. Chakraborti, *Building Planning and Drawing*, Chakraborti Publications, 9th Edition, 2021.
6. Bureau of Indian Standards, *National Building Code of India (NBC) – 2016*, SP 7, Part 1 & 2, Reprint 2021.

ENGINEERING MECHANICS FOR CIVIL ENGINEERS

Course Objectives: This course is expected to enable the student to:

- Provide Knowledge of force systems and free body diagram to analyze rigid body equilibrium
- Comprehend the principles of Friction and solve engineering mechanics problems associated with frictional force
- Compute the centroid, first moment and second moment of an area
- Impart the concept of motion of particles and rigid bodies.
- Familiarize the concepts of work energy method and its applications to translation, rotation and plane motion and the concept of vibrations

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

- Determine resultant of forces acting on a body and analyze equilibrium of a body subjected to a system of forces.
- Solve problem of bodies subjected to friction.
- Find the location of centroid and calculate moment of inertia of a given section.
- Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.
- Interpret and implement work-energy principle and its applications.

UNIT - I

Introduction to Engineering Mechanics– Force Systems: Basic concepts, Particle equilibriumin2-D &3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space –Resultant-Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

UNIT - II

Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, Ladder friction

Centroid and Centre of Gravity -Centroid of Lines, Areas and Volumes from first principle, centroid of composite sections; Centre of Gravity and its implications. –Theorem of Pappus.

UNIT - III

Area moment of inertia - Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Product of Inertia, Parallel Axis Theorem, Perpendicular Axis Theorem.

UNIT - IV

Kinematics of Particles: Kinematics of particles – Rectilinear motion – Curvilinear motion – Projectiles. Kinetics of Particles: Kinetics of particles– Newton's Second Law– Differential equations of rectilinear and curvilinear motion–Dynamic equilibrium–Inertia force–D. Alembert's principle and its application for rectilinear and curvilinear motion.

UNIT - V

Work-Energy Principle: Equation of translation, principle of conservation of energy, work-energy principle applied to particle motion and connected systems, fixed axis rotation. Impulse– Momentum Principle: Introduction, linear impulse momentum, principle of conservation of linear momentum, elastic impact and types of impact, loss of kinetic energy, co efficient of restitution.

TEXTBOOKS:

1. G. Lakshmi Narasaiah (2023) Engineering Mechanics, B.S. Publications
2. Reddy Vijay Kumar K. and J. Suresh Kumar (2024), Singer's Engineering Mechanics– Statics & Dynamics, B.S. Publications
3. Shames and Rao (2006), Engineering Mechanics, Pearson Education
4. S.S. Bhavikatti (2021) Engineering Mechanics, New age International Publishers.

REFERENCE BOOKS:

1. Timoshenko S. P and Young D.H, "Engineering Mechanics", McGraw-Hill International Edition, 2017.
2. Andrew Pytel, Jaan Kiusalaas, "Engineering Mechanics", Cengage Learning, 2014.
3. Bee r F. P & Johnston E. R Jr. Vector, "Mechanics for Engineers", TMH, 2004.
4. Hibbeler R.C & Ashok Gupta, "Engineering Mechanics", Pearson Education, 2010.
5. Tayal D.H.," Engineering Mechanics–Statics & Dynamics", Umesh Publications, 2011.
6. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press, 2008.
7. Meriam.J.L., "Engineering Mechanics", Volume-II Dynamics, John Wiley & Sons, 2008.
8. P.C Dumiretal. "Engineering Mechanics", University press

ADVANCED ENGINEERING PHYSICS LAB

Course Objectives:

1. To provide practical exposure to advanced concepts in solid-state and modern physics.
2. To study the physical properties of materials like semiconductors, ferromagnetic, and ferroelectric substances.
3. To perform semiconductor characterization using Hall effect and band gap experiments.
4. To explore the working principles of lasers and optical fibers through hands-on experiments.
5. To develop skills in data analysis, interpretation, and scientific reporting.

Course Outcomes:

1. **CO1:** Demonstrate working knowledge of laser systems and determine their characteristics.
2. **CO2:** Demonstrate working knowledge of optical fiber parameters through experimental study.
3. **CO3:** Determine key electrical, magnetic, and optical properties of semiconductors and other functional materials.
4. **CO4:** Characterize semiconductors using Hall effect and energy gap measurement techniques.
5. **CO5:** Apply scientific methods for accurate data collection, analysis, and technical report writing.

List of Experiments:

1. A) Determination of numerical aperture of a given optical fibre.
   B) Determination of bending losses of a given optical fibre.
2. Determination of wavelength of a laser using diffraction grating.
3. Study of V-I & L-I characteristics of a given laser diode.
4. Determination of Hall coefficient and carrier concentration of a given semiconductor.
5. Study of B-H curve of a ferromagnetic material.
6. Determination of dielectric constant of a given material.
7. Determination of magnetic moment of a bar magnet and horizontal earth magnetic field.
8. Determination of energy gap of a semiconductor.
9. Determination of work function and Planck's constant using photo electric effect.
10. Study of V-I characteristics and determination of fill factor of solar cell.

Note: Any 8 experiments are to be performed.

PROGRAMMING FOR PROBLEM SOLVING LAB

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

Course Objectives: The students will learn the following:

1. To familiarize students with the use of an IDE to create, compile, run and debug C programs.
2. To provide an understanding of the fundamental steps involved in program development.
3. To introduce the basic concepts of C such as operators, control structures, and functions for problem-solving.
4. To develop knowledge of modular programming, arrays and dynamic memory allocation for writing efficient programs.
5. To expose students to file handling concepts including creating, reading and writing text and binary files.

Course Outcomes: Students are able to:
Demonstrate understanding and application of fundamental C programming constructs.
Develop, trace, and analyze C programs using control structures.
Decompose complex problems into modular solutions using functions.
Implement string manipulation and file handling techniques.
Apply and evaluate searching and sorting algorithms.

PRACTICE SESSIONS:

Simple numeric problems:

a) Write a program for finding the max and min from the three numbers.
b) Write the program for the simple, compound interest.
c) Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
   5 x 1 = 5
   5 x 2 = 10
   5 x 3 = 15
d) Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

a) Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).
b) Write a program that finds if a given number is a prime number.
c) Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

d) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

Arrays, Pointers and Functions:

a) Write a C program to find the minimum, maximum and average in an array of integers.
b) Write a C program that uses functions to perform the following:
   I. Addition of Two Matrices
   II. Multiplication of Two Matrices
c) Write a program for reading elements using a pointer into an array and display the values using the array.
d) Write a program for display values reverse order from an array using a pointer.

Files:

a) Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
b) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file).

Strings:

a) Write a C program that uses functions to perform the following operations:
   I. To insert a sub-string into a given main string from a given position.
   II. To delete n Characters from a given position in a given string
b) Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
c) Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.
d) Write a C program to count the lines, words and characters in a given text.

Sorting and Searching:

a) Write a C program that uses non-recursive function to search for a Key value in a given list of integers using linear search method.
b) Write a C program that uses non-recursive function to search for a Key value in a given sorted list of integers using binary search method.
c) Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.
d) Write a C program that sorts the given array of integers using selection sort in descending order
e) Write a C program that sorts the given array of integers using insertion sort in ascending order
f) Write a C program that sorts a given array of names.

TEXT BOOKS:

1. Program Design in C, Jeri R. Hanly and Elliot B.Koffman, Problem solving 7th Edition, Pearson.
2. C Programming and Data Structures, B.A. Forouzan and R.F. Gilberg, (3rd Edition) Cengage Learning.

REFERENCE BOOKS:

1. The C Programming Language, Brian W. Kernighan and Dennis M. Ritchie, 2nd Edition, Prentice Hall of India
2. Computer fundamentals, E. Balagurusamy, and C, 2nd Edition, McGraw-Hill
3. Let Us C, Yashavant Kanetkar, , 18th Edition, BPB
4. How to solve it by Computer, R.G. Dromey, (16th Impression), Pearson
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. C: The Complete Reference, Herbert Schildt, 4th Edition, Mc Graw Hill,
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

The **English Language and Communication Skills (ELCS) Lab** focuses on listening and speaking skills, particularly on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Listening Skills:
Objectives

1. To enable students develop their active listening skills
2. To equip students with necessary training in listening, so that they can comprehend the speech of people from different linguistic backgrounds

Speaking Skills:

3. To improve their pronunciation and neutralize accent
4. To enable students express themselves fluently and appropriately
5. To practise speaking in social and professional contexts

Learning Outcomes: Students will be able to:

1. Listen actively and identify important information in spoken texts
2. Interpret the speech and infer the intention of the speaker
3. Improve their accent for intelligibility
4. Speak fluently with clarity and confidence
5. Use the language in real life situations

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

a. **Computer Assisted Language Learning (CALL) Lab which focusses on listening skills**
b. **Interactive Communication Skills (ICS) Lab which focusses on speaking skills**

The following course content is prescribed for the **English Language and Communication Skills Lab**.
Exercise – I
CALL Lab:
Instruction: Speech Sounds-Listening Skill - Importance – Purpose - Types- Barriers- Active Listening
Practice: Listening to Distinguish Speech Sounds (Minimal Pairs) **-** *Testing Exercises*
ICS Lab:

- **Diagnostic Test – Activity titled '*Express Your View'***

Instruction: Spoken and Written language - Formal and Informal English - Greetings - Introducing Oneself and Others
Practice: Any Ice-Breaking Activity

Exercise – II CALL Lab:
Instruction: Listening vs. Hearing - Barriers to Listening
Practice: Listening for General Information - Multiple Choice Questions - *Listening Comprehension Exercises (It is essential to identify a suitable passage with exercises for practice.)*
ICS Lab:
Instruction: Features of Good Conversation – Strategies for Effective Communication
Practice: Role Play Activity - Situational Dialogues –Expressions used in Various Situations –Making Requests and Seeking Permissions — Taking Leave - Telephone Etiquette

Exercise - III CALL Lab:
Instruction: Errors in Pronunciation – Tips for Neutralizing Mother Tongue Influence (MTI)
Practice: Differences between British and American Pronunciation –*Listening Comprehension Exercises*
ICS Lab:
Instruction: Describing Objects, Situations, Places, People and Events
Practice: Picture Description Activity – Looking at a Picture and Describing Objects, Situations, Places, People and Events *(A wide range of Materials / Handouts are to be made available in the lab.)*

Exercise – IV CALL Lab:
Instruction: Techniques for *Effective* Listening
Practice: Listening for Specific Details - Listening - Gap Fill Exercises - *Listening Comprehension Exercises*
(It is essential to identify a suitable passage with exercises for practice.)
ICS Lab:
Instruction: How to Tell a Good Story - Story Star- Sequencing-Creativity
Practice: Activity on Telling and Retelling Stories - Collage

Exercise – V CALL Lab:
Instruction: Identifying the literal and implied meaning
Practice: Listening for Evaluation - Write the Summary – Listening Comprehension Exercises
(It is essential to identify a suitable passage with exercises for practice.)
ICS Lab:
Instruction: Understanding Non-Verbal Communication
Practice: Silent Speech - Dumb Charades Activity

- **Post-Assessment Test on 'Express Your View'**

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:**

The Computer Assisted Language Learning Lab has to accommodate 35 students with 35 systems, with one Master Console, LAN facility and English language learning software for self- study by students.
System Requirement (Hardware component):
Computer network with LAN facility (minimum 35 systems with multimedia) with the following specifications:

i) Computers with Suitable Configuration
ii) High Fidelity Headphones

2. **Interactive Communication Skills (ICS) Lab:**
   The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio- visual aids with a Public Address System, a T. V. or LCD, a digital stereo — audio & video system and camcorder etc.

Note: English Language Teachers are requested to prepare Materials / Handouts for each Activity for the Use of those Materials in CALL & ICS Labs.

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).

REFERENCE BOOKS:

1. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* Cambridge University Press
2. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient BlackSwan Pvt. Ltd.
3. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* Cambridge University Press
4. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
5. Ur, Penny and Wright, Andrew. 2022. *Five Minute Activities – A Resource Book for Language Teachers.* Cambridge University Press.

ENGINEERING CHEMISTRY LAB

Course Description: The course includes experiments based on fundamental principles of chemistry essential for engineering students, aiming to develop practical skills and reinforce theoretical concepts.

Course Objectives

1. Students will understand and perform experiments based on core chemical principles relevant to engineering applications.
2. Students will learn to estimate the hardness of water to assess its suitability for drinking purposes.
3. Students will acquire the ability to perform acid-base titrations using instrumental methods such as conductometry, potentiometry, and pH metry.
4. Students will gain hands-on experience in synthesizing polymers like Bakelite and Nylon – 6, 6 in the laboratory.
5. Students will learn to determine the unknown concentration of potassium permanganate (KMnO4) using a calibration curve.

Course Outcomes:

1. Students will develop practical skills through hands-on chemistry experiments relevant to engineering.
2. Students will learn to determine important parameters such as water hardness and the corrosion rate of mild steel under various conditions.
3. Students will be able to apply techniques like conductometry, potentiometry, and pH metry to determine concentrations or equivalence points in acid-base reactions.
4. Students will gain experience in synthesizing polymers such as Bakelite and Nylon-6,6.
5. Students will understand the working principle of colorimetry and the relationship between absorbance and concentration (Beer-Lambert Law).

List of Experiments:

I. Volumetric Analysis: Estimation of Hardness of water by EDTA Complexometry method.

II. Conductometry:

1. Estimation of the concentration of strong acid by Conductometry.
2. Estimation of the concentration of strong and weak acid in an acid mixture by Conductometry.

III. Potentiometry:

1. Estimation of concentration of Fe^{+2}ion by Potentiometry using KMnO4.
2. Estimation of concentration of strong acid with strong base by Potentiometry using quinhydrone

IV. **pH Metry:** Determination of an acid concentration using pH meter.

V. **Colorimetry:** Verification of Lambert-Beer's law using $KMnO_4$.

VI. **Preparations:**
   1. Preparation of Bakelite.
   2. Preparation Nylon – 6, 6.

VII. **Corrosion:** Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

VIII. **Virtual lab experiments:**
   1. Construction of Fuel cell and it's working.
   2. Smart materials for Biomedical applications
   3. Batteries for electrical vehicles.
   4. Functioning of solar cell and its applications.

REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

BASIC ELECTRICAL ENGINEERING LAB

Course Objectives:

1. To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach.
2. To study the transient response of various R, L and C circuits using different excitations.
3. To determine the performance of different types of DC, AC machines and Transformers.

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

CO1: Verify the basic Electrical circuits through different experiments.

CO2: Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods.

CO3: Analyze the transient responses of R, L and C circuits for different input conditions.

List of experiments/demonstrations:

PART- A (compulsory)

1. Verification of KVL and KCL
2. Verification of Thevenin's and Norton's theorem
3. Transient Response of Series RL and RC circuits for DC excitation
4. Resonance in series RLC circuit
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
7. Performance Characteristics of a DC Shunt Motor
8. Torque-Speed Characteristics of a Three-phase Induction Motor.

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

1. Verification of Superposition theorem.
2. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
3. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
4. Measurement of Active and Reactive Power in a balanced Three-phase circuit
5. No-Load Characteristics of a Three-phase Alternator

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:

1. P. Ramana, M. Suryakalavathi, G.T.Chandrasheker,"Basic Electrical Engineering", S. Chand, 2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

ELECTRICAL ENGINEERING LAB

Prerequisites: Introduction to Basic Electrical Engineering.

Course Objectives:

1. To measure the electrical parameters for different types of DC and AC circuits using conventional and theorems approach.
2. To study the transient response of various R, L and C circuits using different excitations.
3. To determine the performance of different types of DC, AC machines and Transformers.

Course Outcomes: Upon successful completion of the course, student must be able to:

CO1: Verify the basic Electrical circuits through different experiments.
CO2: Evaluate the performance calculations of Electrical Machines and Transformers through various testing methods.
CO3: Analyze the transient responses of R, L and C circuits for different input conditions.

List of experiments/demonstrations:

PART- A (compulsory)

1. Verification of KVL and KCL
2. Verification of Thevenin's and Norton's theorem
3. Transient Response of Series RL and RC circuits for DC excitation
4. Resonance in series RLC circuit
5. Calculations and Verification of Impedance and Current of RLC series and Parallel AC circuits
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
7. Performance Characteristics of a DC Shunt Motor
8. Torque-Speed Characteristics of a Three-phase Induction Motor.

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

1. Verification of Superposition theorem.
2. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
3. Measurement of Active and Reactive Power in a balanced Three-phase circuit
4. No-Load Characteristics of a Three-phase Alternator

TEXT BOOKS:

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:

1. P. Ramana, M. Suryakalavathi, G.T. Chandrasheker," Basic Electrical Engineering", S. Chand, 2nd Edition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

ELEMENTS OF ELECTRICAL AND ELECTRONIC ENGINEERING LAB

Prerequisites: Basic Electrical and Electronics Engineering

Course Objectives:

1. To introduce the concepts of electrical circuits and its components.
2. To understand magnetic circuits, DC circuits and AC single phase and three phase circuits.
3. To study and understand the different types of DC, AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.
6. To introduce the concepts of diodes and transistors.
7. To impart the knowledge of various configurations, characteristics and applications.

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

CO1: To analyze and solve electrical circuits using network laws and theorems.
CO2: To understand and analyze basic Electric and Magnetic circuits.
CO3: To study the working principles of Electrical Machines.
CO4: To introduce components of Low Voltage Electrical Installations.
CO5: To identify and characterize diodes and various types of transistors.

List of Experiments:

PART A: ELECTRICAL

1. Verification of KVL and KCL
2. (i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer
   (ii) Verification of Relationship between Voltages and Currents (Star Delta, Delta Delta, Delta Star, Star Star) in a Three Phase Transformer
3. Measurement of Active and Reactive P ower in a balanced Three phase circuit
4. Performance Characteristics of a Separately Excited DC Shunt Motor
5. Performance Characteristics of a Three phase Induction Motor
6. No Load Characteristics of a Three phase Alternator

PART B: ELECTRONICS

1. Identification and study of
   (i) Passive Elements (R,C,L) (ii) Active Elements (Diodes, Transistors and FET) (iii) Multimeters (iv) Function Generator (iv) Regulated Power Supplies (vi) CRO.
2. P-N Junction diode characteristics
3. Zener diode characteristics and Zener as voltage Regulator
4. Input and Output characteristics of Transistor in CB, CE configuration
5. Full Wave Rectifier with and without filters
6. Input and Output characteristics of FET in CS configuration

TEXT BOOKS:

1. Basic Electrical and electronics Engineering, M.S. Sukija and T.K. Nagasarkar, Oxford University press, 1st Edition, 2012.
2. Basic Electrical and electronics Engineering, D.P. Kothari and I.J. Nagarath, McGraw Hill Education, 2nd Edition,2020.

REFERENCE BOOKS:

1. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, PEI and PHI, 9th Edition, 2006.
2. Millman's Electronic Devices and Circuits, J. Millman,C. C. Halkias and Satyabrata Jit, TMH, 2nd Edition, 1998.
3. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, McGraw Hill, 6th Edition, 1971.
4. Linear circuit analysis, Raymond A. De Carlo and Pen, Min, Lin, Oxford University Press 2nd Edition, 2004.
5. Network Theory, N. C. Jagan and C. Lakshminarayana, McGraw Hill, 2nd Edition, 2005.
6. Network Theory, Sudhakar and Shyam Mohan Palli, Tata McGraw Hill, 2nd Edition, 2011.
7. Fundamentals of Electrical Engineering, L. S. Bobrow, Oxford University Press, 12th Edition 2003.
8. Electrical and Electronic Technology, E. Hughes, Pearson Education, 10th Edition, 2010.
9. Electrical Engineering Fundamentals, V. D. Toro, Prentice Hall India, 2nd Edition, 1989.

ENGINEERING WORKSHOP

Course Objectives:

1. To introduce students to basic manufacturing processes and workshop practices.
2. To provide hands-on training in carpentry, fitting, welding, sheet metal, and machining
3. To develop skills in using hand tools and measuring instruments.
4. To enhance safety awareness and proper handling of workshop equipment.
5. To build a foundational understanding of industrial production and fabrication.

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

1. Understand the basic manufacturing processes and operations.
2. Use hand tools and equipment safely and efficiently.
3. Perform basic operations in carpentry, fitting, welding, sheet metal work, and machining
4. Read and interpret workshop drawings
5. Develop teamwork, time management, and quality awareness in a workshop environment.

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

i. Carpentry: T- Lap Joint, Dovetail Joint, Mortise and Tenon Joint
ii. Fitting: V- Fit, Dovetail Fit and Semi- circular fit
iii. Tin Smithy: Square Tin, Rectangular Tray and Conical Funnel
iv. Foundry: Preparation of Green Sand Mould using Single Piece and Split Pattern
v. Welding Practice: Arc Welding and Gas Welding
vi. House wiring: Parallel and Series, Two-way Switch and Tube Light
vii. Black Smithy: Round to Square, Fan Hook and S- Hook

2. TRADES FOR DEMONSTRATION AND EXPOSURE:

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

TEXT BOOKS:

1. Workshop Practice, B. L. Juneja, Cengage Learning India, 1st edition, 2015.
2. Workshop Practice Manual, K. Venkata Reddy, BS Publication, 6th Edition, Rpt.2025

PYTHON PROGRAMMING LAB

Course Objectives:

- To install and run the Python interpreter
- To learn control structures.
- To Understand Lists, Dictionaries in python
- To Handle Strings and Files in Python

Course Outcomes: Students are able to

1. Apply fundamental Python programming concepts to solve basic problems.
2. Implement and manipulate Python data structures including list, tuples, dictionaries, strings, and matrices for data processing.
3. Demonstrate file handling operations, module creation, and exception handling for building robust Python applications.
4. Utilize Object-Oriented Programming principles in Python to design and implement custom classes and graphical representations using canvas.
5. Integrate external Python libraries like NumPy, SciePy, and Tkinter for numerical computing, data visualization, and GUI development.

Note: The lab experiments will be like the following experiment examples.

List of Experiments:

1.
   I. Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   II. Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.
3. Write a program to calculate compound interest when principal, rate and number of periods are given.
4. Read the name, address, email and phone number of a person through the keyboard and print the details.
5. Print the below triangle using for loop. 5
   4 4
   3 3 3
   2 2 2 2
   1 1 1 1 1
6. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character(use 'if-else-if' ladder)
7. Python program to print all prime numbers in a given interval (use break)
8. Write a program to convert a list and tuple into arrays.
9. Write a program to find common values between two arrays.

10. Write a function called palindrome that takes a string argument and returnsTrue if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.
11. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
12. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.
13. Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
14. The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
15. Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.
16. Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
17. Remove the given word in all the places in a string?
18. Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
19. Writes a recursive function that generates all binary strings of n-bit length
20. Write a python program that defines a matrix and prints
21. Write a python program to perform multiplication of two square matrices
22. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
23. Use the structure of exception handling all general-purpose exceptions.
24. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
25. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.
26. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.
27. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.
28. Write a python code to read a phone number and email-id from the user and validate it for correctness.
29. Write a Python code to merge two given file contents into a third file.
30. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.
31. Write a Python code to Read text from a text file, find the word with most number of occurrences
32. Write a function that reads a file *file1*and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.
33. Import numpy, Plotpy and Scipy and explore their functionalities.
34. Install NumPypackage with pip and explore it.
35. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR

36. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

TEXT BOOKS:

1. Supercharged Python: Take your code to the next level, Overland, 2019.
2. Learning Python, Mark Lutz, 5th Edition, O'reilly.

REFERENCE BOOKS:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson, 2018.
2. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, 1st Edition, Pearson
3. Introduction to Python Programming, Gowrishakar S, Veena A, CRC Press, 2018
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, 3rd Edition, India
5. Python for Data Science, Dr. Mohd Abdul Hameed, Wiley publications, 2021.
6. Core Python Programming, Dr. R. Nageswara Rao, 3rd Edition, Dreamtech press.
7. Introduction to Python, Gowrishankar S, Veena A., CRC Press 2018.

IT WORKSHOP

Course Objectives: The IT Workshop for engineers is a training lab course spread over 60 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, PowerPoint and Publisher.

Course Outcomes: Students are able to

- Perform Hardware troubleshooting
- Understand Hardware components and inter dependencies
- Safeguard computer systems from viruses/worms
- Document/ Presentation preparation
- Perform calculations using spreadsheets

PC Hardware

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: 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 with both Windows and Linux. 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.

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

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

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

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of LaTeX 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 toolbars, 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 Capin 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, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clip art, Drawing tool bar and Word Art, Formatting Images, Text boxes, Paragraphs and Mail Merge in word.

Excel

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel — Accessing, overview of toolbars, saving excel files, Using help and resources.

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

Task 2: Calculating GPA - Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

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

PowerPoint

Task 1: Students will be working on basic power point utilities and tools which help them create basic PowerPoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

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

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

REFERENCE BOOKS:

1. Comdex Information Technology course tool kit Vikas Gupta, *WILEY Dreamtech*
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, 3rd edition *WILEY Dreamtech*
3. Introduction to Information Technology, ITL Education Solutions limited, 7th Edition, *Pearson Education.*
4. PC Hardware - A Handbook – 1st Edition Kate J. Chase *PHI* (Microsoft)
5. LaTeX Companion – Leslie Lamport, 2nd Edition, *PHI/Pearson*.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfinson and Ken Quamme Third Edition by — *CISCO Press, Pearson Education*.
7. IT Essentials PC Hardware and Software Labs and Study Guide by Patrick Regan, Third Edition— CISCO Press, *Pearson Education.*

APPLIED PYTHON PROGRAMMING LAB

Course Objectives:

1. To outline the fundamental Concepts and illustrate the basic programs.
2. To develop python codes for different applications.
3. To utilize Raspberry PI to implement basic hardware applications.

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

CO1: Outline the fundamental Concepts and illustrate the basic programs.
CO2: Develop python codes for different applications.
CO2: **U**tilize Raspberry PI to implement basic hardware applications.

LIST OF EXPERIMENTS:

Cycle - 1

1. Downloading and Installing Python and Modules
   a) Python 3 on Linux
      Follow the instructions given in the URL https://docs.python-guide.org/starting/install3/linux/
   b) Python 3 on Windows
      Follow the instructions given in the URL https://docs.python.org/3/using/windows.html (Please remember that Windows installation of Python is harder!)
   c) pip3 on Windows and Linux
      Install the Python package installer by following the instructions given in the URL https://www.activestate.com/resources/quick-reads/how-to-install-and-use-pip3/
   d) Installing numpy and scipy
      You can install any python3 package using the command pip3 install <packagename>
   e) Installing jupyterlab
      Install from pip using the command pip install jupyterlab
2. Introduction to Python3
   a) Printing your biodata on the screen
   b) Printing all the primes less than a given number
   c) Finding all the factors of a number and show whether it is a *perfect* number, i.e., the sum of all its factors (excluding the number itself) is equal to the number itself
3. Defining and Using Functions
   a) Write a function to read data from a file and display it on the screen
   b) Define a boolean function *is palindrome*(<input>)
   c) Write a function *collatz(x)* which does the following: if x is odd, $x = 3x + 1$; if x is even, then $x = x/2$. Return the number of steps it takes for $x = 1$
   d) Write a function $N(m, s) = exp(-(x-m)^2/(2s^2))/sqrt(2\pi)s$ that computes the Normal distribution
4. The package numpy
   a) Creating a matrix of given order $m \times n$ containing *random numbers* in the range 1 to 99999

b) Write a program that adds, subtracts and multiplies two matrices. Provide an interface such that, based on the prompt, the function (addition, subtraction, multiplication) should be performed

c) Write a program to solve a system of *n* linear equations in *n* variables using matrix inverse

5. The package scipy and pyplot
   a) Finding if two sets of data have the same *mean* value
   b) Plotting data read from a file
   c) Fitting a function through a set a data points using *polyfit* function
   d) Plotting a histogram of a given data set
6. The strings package
   a) Read text from a file and print the number of lines, words and characters
   b) Read text from a file and return a list of all *n* letter words beginning with a vowel
   c) Finding a secret message hidden in a paragraph of text
   d) Plot a histogram of words according to their length from text read from a file

Cycle -2

7. Installing OS on Raspberry Pi

a) Installation using PiImager

b) Installation using image file

- Downloading an Image, Writing the image to an SD card
- using Linux, using Windows
- Booting up

Follow the instructions given in the URL https://www.raspberrypi.com/documentation/computers/getting-started.html

8. Accessing GPIO pins using Python
   a) Installing GPIO Zero library.
      First, update your repositories list: *sudo apt update*
      Then install the package for Python 3: *sudo apt install python3-gpiozero*
   b) Blinking an LED connected to one of the GPIO pin
   c) Adjusting the brightness of an LED
   d) Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength.
9. Collecting Sensor Data
   a) DHT Sensor interface
      - Connect the terminals of DHT GPIO pins of Raspberry Pi.
      - Import the DHT library using *import Adafruit_DHT*
      - Read sensor data and display it on screen.

DATA STRUCTURES LAB

Prerequisites: 1. A Course on "Programming for problem solving".

Course Objectives:

1. To enable students to implement programs in C for solving problems using fundamental programming constructs.
2. To provide practical exposure to the implementation of linear data structures such as arrays, stacks, and queues.
3. To develop skills in applying searching and sorting algorithms to process and organize data efficiently.
4. To impart hands-on experience with non-linear data structures such as linked lists, trees, and graphs.
5. To train students in analyzing the performance of different algorithms and selecting appropriate data structures for problem–solving.

Course Outcomes: Students are be able to

1. Implement and manipulate various types of linked lists with fundamental operations.
2. Design and develop stack and queue data structures using arrays and abstract data types.
3. Apply and implement different sorting algorithms to organize data in ascending order.
4. Construct and traverse complex tree data structures including Binary Search Trees, B-Trees, B+ Trees, AVl Trees, and Red-Black Trees.
5. Implement graph traversal algorithms and various hashing functions for efficient data searching and storage.

List of Experiments

1. Write a program that uses functions to perform the following operations on singly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a program that implement stack (its operations) using
   i) Arrays ii) ADT
5. Write a program that implement Queue (its operations) using
   i) Arrays ii) ADT
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
   i) Radix Sort, ii) Heap sort, iii) Shell Sort, iv) Tree Sort
7. Write a program to implement the tree traversal methods (Recursive and Non-Recursive).
8. Write a program to implement
   i) Binary Search tree ii) AVL trees iii) Red - Black trees
9. Write a program to implement the graph traversal methods.

10. Write a program to implement the following Hash Functions: i) Division Method, ii) Multiplication Method, iii) Mid-square Method, iv) Folding Method

TEXT BOOKS:

1. Fundamentals of Data Structures in C, , E. Horowitz, S. Sahni and Susan Anderson Freed, 2nd Edition Universities Press.
2. Data Structures using C A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, - 2nd Edition, PHI/Pearson Education.

REFERENCE BOOK:

1. Data Structures: A Pseudocode Approach with C, R. F. Gilberg and B. A. Forouzan, 2nd Edition, Cengage Learning.

NOTE

NOTE

Student Handbook B. Tech 1st Year (2025-26)