ACADEMIC REGULATIONS
R25

Bachelor of Technology (B.Tech)

B. Tech. - Regular Four Year Degree Programme
(For batches admitted from the academic year 2025-2026)
&
(For batches admitted Lateral Entry Scheme from the academic year 2026-2027)

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ACADEMIC REGULATIONS (R25)

B. Tech. - Regular Four Year Degree Programme

(For batches admitted from the academic year 2025-26)

1.0 For pursuing four year Under Graduate Degree Programme of study in Engineering & Technology (UGP in E&T) offered by MLR Institute of Technology under Autonomous status is herein referred to as MLRIT (Autonomous):

All the rules specified herein approved by the Academic Council will be in force and applicable to students admitted from the Academic Year 2025-26 onwards. Any reference to "Institute" or "College" in these rules and regulations shall stand for MLR Institute of Technology (Autonomous).

All the rules and regulations, specified hereafter shall be read as a whole for the purpose of interpretation as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, MLR Institute of Technology shall be the chairman Academic Council.

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 college or on the basis of any other order of merit approved by the college, 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** 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 **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 college.

5.8 **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 studied that course so far. Similarly, Open Elective courses being studied should not match with any courses of the forthcoming semesters.

5.9 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 college 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.

5.10 **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.

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

5.12 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 college 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 for 5 marks. 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 HODs shall schedule these sessions in their semester plan.

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

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 College.

9.3 Semester End Examination for theory courses

9.3.1 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.

9.3.2 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.

9.3.3 Duration of SEE:

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

9.4 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 college outside their cluster and not from a group colleges.

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

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.

9.5 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.

9.6 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.

9.6.1 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.

9.7 UG Project Work:

9.7.1 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.

9.7.2 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.

9.7.3 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

9.7.4 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.

9.7.5 For conducting viva-voce exam of project work, principal appoints an external examiner. The external examiner may be selected from the list of experts submitted by the HOD of the college.

9.7.6 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.

9.8 Skill Development Courses:

Four Skill Development Courses are included in the Curriculum in II-1, II-2, III-1 and III-2 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.

9.9 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 College 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 $\geq$ 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 $\geq$ 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

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

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 ith course, and G_i represents the grade points corresponding to the letter grade awarded for that ith 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

$$\textbf{CGPA} = \{ \sum_{i=1}^{N} C_i G_i \} / \{ \sum_{i=1}^{N} C_i \}$$

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), C_j is the no. of credits allotted to the j^{th} course, and G_j 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 College at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the student may be withheld, and the student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

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

$$\text{Percentage (\%) of Marks} = (\text{Final CGPA} - 0.5) \times 10$$

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 college-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 college'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 college, then student should consult the college 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 college permission through the Principal of the college.

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 college. All these details are summarized in a set of look-up Table; one set for each B. Tech. branch.

22.6 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 college from various other Universities/institutions is having back-logs at the previous University/institute, have to pass the courses offered at MLRIT/JNTUH which are equivalent to the failed courses at the previous University/institute.

23.3 The transferred students from other Universities/Institutions to MLRIT, shall be given a chance to write CBTs for getting CIE component in the **equivalent course(s).**

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 chairman, academic council is final.

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

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

27.0 **Malpractice Prevention Committee**

A malpractice prevention committee shall be constituted to examine and punish the students who involve in malpractice / indiscipline in examinations. The committee shall consist of:

a) Controller of examinations - Chairman
b) Addl. Controller of examinations.- Member Convener
c) Subject expert - member
d) Head of the department of which the student belongs to. - Member
e) The invigilator concerned - member

The committee shall conduct the meeting after taking explanation of the student and punishment will be awarded by following the malpractice rules meticulously.

Any action on the part of candidate at the examination like trying to get undue advantage in the performance at examinations or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the Staff who are in charge of conducting examinations, valuing examination papers and preparing / keeping records of documents relating to the examinations, in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and will be recommended for appropriate punishment after thorough enquiry.

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MLR Institute of Technology

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 credits and secure 120 credits with CGPA ≥ 5 from II year to IV-year B.Tech. programme (LES) for the award of B.Tech. degree.
3. The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.
4. The attendance requirements of B.Tech. (Regular) shall be applicable to B.Tech. (LES).
5. **Promotion rule**

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to Second year second semester	Regular course of study of second year first semester 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.

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

Malpractices Rules
Disciplinary Action For / Improper Conduct in Examinations

Rule	Nature of Malpractices/ Improper conduct	Punishment
	If the student:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The hall ticket of the student is to be cancelled
3.	Impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the chief superintendent/COE/ACoE/any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
8.	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.

9.	If student of the college, who is not a student for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to the police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared for including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared for including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Principal for further action to award a suitable punishment.	

Malpractices identified by squad or special invigilators

1. Punishments to the students as per the above guidelines.
2. Punishment for staff: (if the squad reports that the staff is also involved in encouraging malpractices)
   a. A show-cause notice shall be issued to the staff.
   b. Impose a suitable fine on the staff.

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COURSE STRUCTURE
B.Tech- Electronics and Communication Engineering

R25			ECE							
I B.Tech-I SEMESTER										
				Hours per Week				**Scheme of Examination Maximum Marks**		
S.NO.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**	**Internal (CIE)**	**External (SEE)**	**Total**
1	A7BS01	Matrices and Calculus	BSC	3	1	0	4	40	60	100
2	A7BS08	Advanced Engineering Physics	BSC	3	0	0	3	40	60	100
3	**A7CS01**	Programming for Problem Solving	ESC	3	0	0	3	40	60	100
4	A7ME02	Computer Aided Engineering Drawing	ESC	2	0	2	3	40	60	100
5	A7EE06	Introduction To Electrical Engineering	ESC	2	0	0	2	40	60	100
6	A7HS01	English for Skill Enhancement	HSC	3	0	0	3	40	60	100
7	A7BS09	Advanced Engineering Physics Lab	BSC	0	0	2	1	40	60	100
8	**A7CS02**	Programming for Problem Solving Lab	ESC	0	0	2	1	40	60	100
9	A7HS02	English Language and Communication Skills Lab	HSC	0	0	2	1	40	60	100
10		Induction Program								
	TOTAL			**16**	**1**	**8**	**21**	**360**	**540**	**900**

I B.Tech-II SEMESTER										
				Hours per Week				**Scheme of Examination Maximum Marks**		
S.NO.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**	**Internal (CIE)**	**External (SEE)**	**Total**
1	A7BS02	Ordinary Differential Equations and Vector Calculus	BSC	3	0	0	3	40	60	100
2	A7BS10	Engineering Chemistry	BSC	3	0	0	3	40	60	100
3	A7EC03	Electronic Measurements and Sensors	PCC	3	0	0	3	40	60	100
4	A7CS63	Data Structures Using C	PCC	3	0	0	3	40	60	100
5	A7EE07	Network Analysis and Synthesis	ESC	3	0	0	3	40	60	100
6	A7ME03	Engineering Work shop	ESC	0	0	2	1	40	60	100
7	A7BS11	Engineering Chemistry Lab	BSC	0	0	2	1	40	60	100
8	A7EC04	Applied Python Programming Lab	PCC	0	0	2	1	40	60	100
9	A7CS64	Data Structures Using C Lab	PCC	0	0	2	1	40	60	100
10	A7EE08	Electrical Engineering Laboratory	ESC	0	0	2	1	40	60	100
	TOTAL			**15**	**0**	**10**	**20**	**400**	**600**	**1000**

R25			ECE							
II- B.Tech-I SEMESTER										
				Hours per Week				**Scheme of Examination Maximum Marks**		
S.NO.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**	**Internal (CIE)**	**External (SEE)**	**Total**
1	A7EC05	Electronic Devices and Circuits	PCC	3	0	0	3	40	60	100
2	A7EC06	Signals and Systems	PCC	3	0	0	3	40	60	100
3	A7EC07	Control Systems	PCC	2	0	0	2	40	60	100
4	A7EC08	Digital Logic Design	PCC	3	0	0	3	40	60	100
5	A7EC09	Probability Theory and Stochastic Processes	PCC	3	0	0	3	40	60	100
6	A7HS08	Innovation and Entrepreneurship	HSC	2	0	0	2	40	60	100
7	A7EC10	Modelling and Simulation Lab	PCC	0	0	2	1	40	60	100
8	A7EC11	Electronic Devices and Circuits Lab	PCC	0	0	2	1	40	60	100
9	A7EC12	Digital Logic Design Lab	PCC	0	0	2	1	40	60	100
10	A7EC13	Skill Development Course -1 Linux and Shell Scripting	PCC	0	0	2	1	40	60	100
11	A7BS12	Environmental Science	BSC	1	0	0	1	40	60	100
	TOTAL			**17**	**1**	**8**	**21**	**440**	**660**	**1100**

II B.Tech-II SEMESTER										
				Hours per Week				**Scheme of Examination Maximum Marks**		
S.NO.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**	**Internal (CIE)**	**External (SEE)**	**Total**
1	A7BS06	Numerical Methods and Complex Variables	BSC	3	0	0	3	40	60	100
2	A7EC14	Electromagnetic Fields and Transmission Lines	PCC	3	0	0	3	40	60	100
3	A7EC15	Analog and Digital Communications	PCC	3	0	0	3	40	60	100
4	A7EC16	Electronic Circuit Analysis	PCC	3	0	0	3	40	60	100
5	A7EC17	Linear and Digital IC Applications	PCC	3	0	0	3	40	60	100
6	A7BS07	Computational Mathematics Lab	BSC	0	0	2	1	40	60	100
7	A7EC18	Analog and Digital Communications Laboratory	PCC	0	0	2	1	40	60	100
8	A7EC19	Electronic Circuit Analysis Lab	PCC	0	0	2	1	40	60	100
9	A7EC20	Linear and Digital IC Applications Lab	PCC	0	0	2	1	40	60	100
10	A7EC21	Skill Development course -2 Sensor and Circuit Design/SQL	PCC	0	0	2	1	40	60	100
	TOTAL			**15**	**0**	**10**	**20**	**400**	**600**	**1000**

MATRICES & CALCULUS - R25

I Year I Semester:

Course Code:	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A7BS01	BSC	3	1	0	4	40	60	100
Contact Classes: 48	Tutorial Classes: 08	Practical Classes: Nil				Total Classes: 56		

Course Objectives : To learn

1. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
2. Concept of eigenvalues and eigenvectors and to reduce the quadratic form to canonical form.
3. Geometrical approach to the mean value theorems and their application to the mathematical problems.
4. Finding maxima and minima of functions of two and three variables.
5. Evaluation of multiple integrals and their applications.

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

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

UNIT-I	MATRICES	Classes: 08

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 Seidel Iteration Method.

UNIT-II	EIGEN VALUES AND EIGEN VECTORS	Classes: 10

Eigen values – Eigen vectors and their properties– Diagonalization of a matrix by Orthogonal Transformation – 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 form by Orthogonal Transformation.

UNIT-III	SINGLE VARIABLE CALCULUS	Classes: 10

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 (All theorems without proof).

Curve Tracing: Curve tracing in Cartesian coordinates.

UNIT-IV	**MULTIVARIABLE CALCULUS (PARTIAL DIFFERENTIATION AND APPLICATIONS)**	**Classes: 10**

Definitions of Limit and continuity – Partial Differentiation: Applications of Euler's Theorem– Total derivative – Jacobian – Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V	**MULTIPLE INTEGRALS**	**Classes: 10**

Evaluation of Double Integrals (Cartesian and polar coordinates) – change of order of integration (only Cartesian form) – Change of variables for double integrals (Cartesian to polar). Evaluation of Triple Integrals, Applications: Areas by double integrals and volumes by 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, 5thEditon, 2016.

Reference Books:

1. ErwinKreyszig, 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. RajnishVerma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

Web references:

1. https://www.efunda.com/math/math_home/math.cfm
2. https://www.sosmath.com/
3. https://www.wolframalpha.com/

E -Text Books:

1.https://www.e-booksdirectory.com/details.php?ebook=10166
2. Calculus and Linear Algebra. Vol. 1 - Download link (e-booksdirectory.com)

MOOCS Course:

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in/

ADVANCED ENGINEERING PHYSICS R25

I Year B. Tech :

Course Code:	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	3	CIA	SEE	TOTAL
A7BS08	BSC	3	0	0		40	60	100
Contact Classes: 48	Tutorial Classes: 08	Practical Classes: Nil				Total Classes: 56		

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 introduce quantum computing principles, quantum gates, and basic quantum algorithms.
4. To learn the properties and applications of magnetic and dielectric materials.
5. To explore the working and applications of lasers and fiber optics in modern technology.

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 behaviour and energy band formation in solids.
3. **CO3**: Apply quantum gates (Pauli –X, Y, Z, Hadamard, CNOT, SWAP) to construct basic quantum circuits for simple computational tasks.
4. **CO4**: Classify magnetic and dielectric materials and explain their properties, synthesis, and applications.
5. **CO5**: Explain the principles of lasers and fibre optics and their applications in communication and sensing.

UNIT - I: Crystallography & Materials Characterization

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: Schottky and Frenkel defects, concept of nanomaterials: surface to volume ratio, X -ray diffraction: Bragg's law, powder method, calculation of average crystallite size using Debye Scherrer's formula, scanning electron microscopy (SEM): block diagram, working principle.

UNIT - II: Quantum Mechanics

Introduction, de-Broglie hypothesis, Heisenberg uncertainty principle, physical significance of wave function, postulates of quantum mechanics: operators in quantum mechanics (qualitative), eigen values and eigen functions, expectation value (qualitative); Schrödinger's time independent

wave equation, particle in a 1D box, Bloch's theorem (qualitative), Kronig-Penney model (qualitative): E-k diagram, effective mass of electron, formation of energy bands, origin of bandgap, classification of solids, concept of discrete energy levels and quantum confinement in nanomaterials.

UNIT - III: Quantum Computing

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, quantum computing system for information processing, evolution of quantum systems, quantum measurements, entanglement, quantum gates (Pauli-X, Y, Z, Hadamard, CNOT, SWAP), challenges and advantages of quantum computing over classical computation, : quantum algorithms: Deutsch-Jozsa, Grover.

UNIT - IV: Magnetic and Dielectric Materials

Introduction to magnetic materials, origin of magnetic moment-classification of magnetic materials, hysteresis, Weiss domain theory of ferromagnetism, soft and hard magnetic materials, synthesis of ferrimagnetic materials using sol-gel method, applications: magnetic hyperthermia for cancer treatment, magnets for EV.

Introduction to dielectric materials, types of polarization (qualitative): electronics, ionic & orientation; ferroelectric, piezoelectric, pyroelectric materials and their applications: Ferroelectric Random-Access Memory (Fe-RAM), load cell and fire sensor.

UNIT - V: Laser and Fibre Optics

Introduction to laser, characteristics of laser, spontaneous and stimulated emission, Einstein coefficients and their relations, metastable state, population inversion, pumping, lasing action, Ruby laser, CO_2 laser, semiconductor diode laser, applications: Bar code scanner, LIDAR for autonomous vehicle.

Introduction to fibre optics, total internal reflection, construction of optical fibre, acceptance angle, numerical aperture, classification of optical fibres-Step index, Graded Index, single mode step index, multimode step index, multimode graded index, losses in optical fibre, applications: optical fibre for communication system, sensor for structural health monitoring.

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Jozef Gruska, *Quantum Computing*, McGraw Hill
2. Michael A. Nielsen & Isaac L. 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

PROGRAMMING FOR PROBLEM SOLVING

I/I Semester:								
Course Code	**Category**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
A7CS01	**ESC**	3	-	-	3	40	60	100
Contact Classes: 50	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 50**		

Course Objectives:

1) To familiarize with the syntax and semantics of C programming language.
2) To learn the usage of structured programming approach in solving problems.
3) To use arrays, pointers, strings and structures in solving problems.
4) To understand how to solve problems related to matrices, Searching and sorting.
5) To understand how to use files to perform read and write operations.

Course Outcomes:

After course completion the student able to

1) To demonstrate the ability to write and understand basic C programs using language elements, variable declarations, arithmetic expressions, and selection structures.
2) Develop computer programs using programming constructs and control structures and to use arrays to develop C programs
3) Decompose a problem into functions to develop modular reusable code and to use pointers to solve complex problems.
4) To utilize string manipulation functions and user-defined structures and unions to design and implement algorithms in C.
5) To perform file operations and implement searching and sorting algorithms.

UNIT-I	**OVERVIEW OF C AND SELECTION STRUCTURES**	**Classes: 10**

Overview of C: C Language Elements, Variable Declarations and Data Types, Executable Statements, General Form of a C Program, Arithmetic Expressions, Formatting Numbers in Program Output.

Selection Structures: Control Structures, Conditions, if Statement, if Statements with Compound Statements, Decision Steps in Algorithms.

UNIT-II	**REPETITION, LOOP STATEMENTS AND ARRAYS**	**Classes: 10**

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.

Arrays: Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Array Arguments, Parallel Arrays and Enumerated Types, Multidimensional Arrays.

UNIT-III	FUNCTIONS AND POINTERS	Classes: 10

Top-Down Design with Functions: Library Functions, Top-Down Design and Structure Charts, Functions without Arguments, Using Array Elements as Function Arguments, Parameter Passing Techniques: Call by Value, Call by Reference, Functions with Input Arguments.
Recursion: The Nature of Recursion, Tracing a Recursive Function, Recursive Mathematical Functions, storage classes.
Pointers and Modular Programming: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, Functions returning pointers, Dynamic memory allocation

UNIT-IV	STRINGS AND USER DEFINED DATA TYPES	Classes: 10

Strings: String Basics, String Library Functions: Assignment and Substrings, Longer Strings: Concatenation and Whole-Line Input, String Comparison, Arrays of strings.
Structure and Union Types: User- Defined Structure Types, Structure Type Data as Input and Output Parameters, Functions with Structured Result Values, Union Types.x

UNIT-V	FILE HANDLING, SEARCHING AND SORTING	Classes: 10

File Handling: Command Line Arguments, File Modes, Basic File Operations Read, Write and Append, Example Programs. Random Access Using fseek, ftell and rewind Functions.
Basic Searching and Sorting Algorithms: Linear and Binary Search, Bubble Sort, Insertion Sort, Selection Sort.

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, McGrawHill
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, McGraw-Hill, 4th Edition
7) Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

Web References:

1. https://en.wikipedia.org/wiki/Computational_thinking
2. https://nptel.ac.in/courses/106/104/106104128/
3. https://en.cppreference.com/w/c/language
4. https://www.learn-c.org/

E-Text Books:

1. https://slidelegend.com/queue/computational-thinking-for-the-modern-problem solver_59d6f01e1723ddb0c7a0df47.html
2. http://www.freebookcentre.net/Language/Free-C-Programming-Books-Download.htm

MOOC Course

1) https://www.coursera.org/learn/computational-thinking-problem-solving
2) https://onlinecourses.nptel.ac.in/noc18_cs33/preview
3) https://www.alison.com/courses/Introduction-to-Programming-in-c
4) http://www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-s096-effective programming-in-c-and-c-january-iap-2014/index.html

COMPUTER AIDED ENGINEERING DRAWING

I/II Semester:								
Course Code	**Category**	**Hours / Week**			**Credit**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
A7ME02	**ESC**	2	0	2	3	40	60	100
Contact Classes: 50	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 50**		

Course Objectives:

1. To develop foundational knowledge in engineering drawing, projection systems, and CAD applications
2. To build skills in drawing engineering curves and in representing projections of points, lines and planes
3. To enable students to prepare and analyze technical drawings using computer-aided design tools
4. To develop an understanding of standard dimensioning methods and drafting conventions
5. To enhance the ability to visualize engineering components in three dimensions

Course Outcomes:

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

1. Explain various commands and create 2D Engineering Drawings using AutoCAD.
2. Construct the various curves used for engineering applications
3. Prepare orthographic projections of lines, planes by visualizing them in different positions.
4. Solve the problems of projections of solids and development of surfaces for industrial needs.
5. Construct the isometric view into orthographic views and vice versa..

UNIT-I	**Introduction to Engineering Drawing and Computer Aided Drafting**	**Classes: 10**

Introduction to Engineering Drawing: Principles and their significance,
Introduction to Computer Aided Drafting: Initial Setup Commands, Draw Commands, Modify Commands, 2D Drawings - Simple Exercises.

UNIT-II	**Engineering Curves**	**Classes: 10**

Engineering Curves: Ellipse, Parabola, and Hyperbola (General Method only).
Special curves: Cycloid, Epi-cycloid, Hypocycloid and Involutes (simple Exercises).

UNIT-III	**Projections of Points, Lines and Planes**	**Classes: 10**

Principles of Orthographic Projections: Conventions, First and Third angle projections.
Projections of points, Projection of Lines inclined to both the planes.
Projections of Planes: Projections of regular planes inclined to both planes.

UNIT-IV	Projections of Solids and Development of Surfaces	Classes: 10
Projection of Solids: Regular Solids inclined to both planes (Prisms, Pyramids, Cylinders and Cone).Development Of Surfaces: Theory of development, development of lateral surface with base (Prisms, Pyramids,Cylinders and Cone).		
UNIT-V	**Isometric and Orthographic Projections**	**Classes: 10**
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 view to Orthographic views and Orthographic views to isometric view.		

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., 3rdEdition, 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, 3rdEdition, 2020.
3. Engineering Drawing, M. B. Shah and B.C. Rane, Pearson, 2nd Edition, 2009.

INTRODUCTION TO ELECTRICAL ENGINEERING (ECE)

I B. Tech I Sem (R25)

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	TOTAL
A7EE06	ESC	3	0	0	2	40	60	100
Contact Classes:50	Tutorial Classes:	Practical Classes: 24				Total Classes: 24		

Prerequisites: Mathematics

Course Objectives:

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

Course Outcomes:

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

1. Analyze and solve for current values in resistive circuits with independent sources.
2. Analyze and solve for current and voltage values of R-L-C circuits with AC Excitations.
3. Analyze the working of Transformer and solve the numerical problems
4. Analyze the working of AC and DC electrical machines and solve the numerical problems.
5. Design Basic Electrical Circuits and Install Electrical Wiring Systems

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's and Norton Theorems, Maximum Power Transfer Theorem. 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.
3.P. Ramana, M. Suryakalavathi, G.T. Chandrasheker, “Basic Electrical Engineering”, S. Chand, 2nd Edition, 2019.
4.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.
5.Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, “Basic Electrical Engineering”, 2nd Edition, McGraw Hill, 2021.
6.L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
7.E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
8.V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

ENGLISH FOR SKILL ENHANCEMENT R25

I Year B. Tech								
Course Code:	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
A7HS01	**HSC**	**L**	**T**	**P**	**3**	**CIA**	**SEE**	**TOTAL**
		3	**0**	**0**		**40**	**60**	**100**
Contact Classes:50	**Tutorial Classes: 0**	**Practical Classes: 24**				**Total Classes: 24**		

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 aims:

a. To build a strong vocabulary base that enhances students' comprehension and ability to express ideas clearly and appropriately in academic, social, and professional contexts.Use appropriate sentence structures in their oral and written communication.
b. To strengthen students' understanding of English grammar for constructing syntactically correct and contextually appropriate sentences in both spoken and written communication.

c. To develop strategic reading skills such as skimming, scanning, and inferencing for better interpretation of texts and extraction of key information.
d. To enable students to write a range of academic and professional documents, ensuring coherence, organization, and purpose-driven content.
e. To develop their critical and cultural awareness through literary and non-literary texts, enabling students to analyze themes and reflect on ethical, cultural and societal issues.

COURSE OUTCOMES

Students will be able to:

I. Students will be able to remember, understand, and apply an expanded range of vocabularies and their usages to comprehend texts and communicate ideas effectively in various academic, social, and professional contexts.
II. Students will be able to apply grammatical rules to produce error-free sentences for effective oral and written communication skills n professional and personal setups.
II. Students will be able to apply effective reading strategies such as skimming and scanning to extract essential information from texts and demonstrate improved comprehension.
V. Students will be able to compose well-structured and coherent written documents such as paragraphs, essays, letters, emails, reports, and resumes for academic and professional purposes
V. Students will be able to analyze and compare textual themes in relation to their socio-cultural and ethical contexts, and critically reflect on their implications.

SYLLABUS

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 BlackSwan 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.

Prescribed Textbook

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

References:

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 Univeristy 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.

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ADVANCED ENGINEERING PHYSICS LABORATORY

I Year B. Tech								
Course Code:	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
A7BS09	**BSC**	**L**	**T**	**P**	**1**	**CIA**	**SEE**	**TOTAL**
		0	**0**	**2**		**40**	**60**	**100**

Course Objectives:

1. To provide practical exposure to advanced concepts in solid-state and modern physics.
2. To synthesize and study the physical properties of materials like semiconductors, ferromagnetic, and ferro electric 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:** Synthesize and analyze nanomaterials such as magnetite (Fe_3O_4) using chemical methods.
2. **CO2:** Determine electrical, magnetic, dielectric, optical properties of functional materials and validation of quantum theory of radiation.
3. **CO3:** Characterize semiconductors using Hall effect and energy gap measurement techniques.
4. **CO4:** Demonstrate working knowledge of laser systems and optical fiber parameters through experimental study.
5. **CO5:** Apply scientific methods for accurate data collection, analysis, and technical report writing.

LIST OF EXPERIMENTS:

1. **Magnetite Powder:** To synthesize magnetite (Fe_3O_4) powder using sol-gel method (CO1)
2. **Energy gap of a semiconductor:** To determine the energy gap of a given semiconductor (CO3)
3. **Hall Effect:** To determine the Hall coefficient and carrier concentration of a given semiconductor. (CO3)
4. **Magnetic Moment:** To determine the magnetic moment of a bar magnet and horizontal earth magnetic field. (CO2)
5. **B-H Curve:** To study of B-H curve of a ferro magnetic material (CO2)
6. **Stewart Gee's Experiment:** To study the variation of magnetic field along the axis of a circular coil and calculation of magnetic flux. (CO2)
7. **Dielectric constant:** To determine the dielectric constant of a given material (CO2)
8. **Planck's Constant:** To determine value of Planck's constant by measuring radiation in fixed spectral range. (CO2)
9. **(a) Wavelength of Laser:** To determine the wavelength of a laser using diffraction grating (CO4)

   (b) V-I and L-I characteristics: To study of V-I & L-I characteristics of a given laser diode (CO4)

10. **(a)Numerical Aperture:** To determine the numerical aperture of a given optical fiber (CO4)

    (b) Bending Loss: To determine the bending losses of a given optical fiber (CO4)

11. **Physics Project**: Students are required to design a prototype based on one of the above experiments no 1-10 (CO5).

(Note: Any 8 experiments are to be performed.)

PROGRAMMING FOR PROBLEM SOLVING LAB

I - I Semester:

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A7CS02	ESC	-	-	2	1	40	60	100
Contact Classes: 12	Tutorial Classes: Nil	Practical Classes: 24				Total Classes:24		

COURSE OBJECTIVES:

1) To be familiarize with basic programs to solve simple problems
2) To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
3) To develop modularized, reusable and readable C Programs using the concepts like functions, arrays, strings, pointers and structures.
4) To develop programs to perform read and write operations on files.

COURSE OUTCOMES:

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

1) Solve simple mathematical problems using basic c programs.
2) Correct syntax errors as reported by the compilers and logical errors encountered at run time and develop programs by using decision making and looping constructs.
3) Implement real time applications using the concept of array, pointers, functions and structures.
4) Develop programs to perform different operations on files in c.

LIST OF EXPERIMENTS

Week-1	**BASIC PROGRAMS**

1.You are working on an Academic Performance Engine (APE) that decides student eligibility for semester continuation based on the following conditions:

2. In an automated hospital assessment system, a patient's condition is analyzed to determine the appropriate department for admission.

Week-2	**BASIC DATA TYPES**

	1. In a rural banking ATM, due to power fluctuations, the server sometimes receives an incorrect denomination order. You're tasked to: • Take two amounts a and b, where a is expected to be the withdrawal amount, but due to signal reversal, values may be swapped. • Without using any extra variables, restore the actual order such that the larger number becomes the withdrawal amount (a should store larger value, b the smaller one). • If they're equal, leave them unchanged. 2. You're building a personal health tracker. The app calculates a **Health Risk Index (HRI)** for a user based on three readings: • x: Heart Rate Variability (HRV) • y: Average Sleep Hours • z: Stress Level Index You must calculate: 1. HRI Score = (x + y + z) / (x - y - z) 2. Sleep-Adjusted Average = (x + y + z) / 3 3. Recovery Index = (x + y) × (x - y) × (y - z) However, there's a rule: If the denominator in expression 1 is 0, print: Invalid HRI Score
Week-3	**OPERATORS**
1. An industrial machine's heat dissipation unit generates a circular heat zone, and a monitoring system is used to evaluate safety. The system should: 1. Accept: ○ Radius of the heat zone (r) ○ Temperature (T) in Celsius 2. Compute: ○ Area = $\pi \times r^2$ ○ Perimeter = $2 \times \pi \times r$ ○ Use $\pi = 3.1416$ 3. Based on area and temperature: ○ If T > 100AND area > 500 → "Critical Risk" ○ If T > 80OR perimeter > 150 → "Warning"	

- Else → "Safe"

2. In a smart electricity billing system, industrial customers are billed dynamically based on their usage slab.

You must:

1. Accept:
   - Consumer ID (consumer_id)
   - Units consumed (units)
   - Cost per unit (cost)
2. Compute:
   - Base amount = units × cost
   - Apply surcharge:
     - If units > 1000 → 18% surcharge
     - If 501–1000 → 10% surcharge
     - If 200–500 → 5% surcharge
     - Else → No surcharge
   - Final bill = base + surcharge
   - Round the bill to nearest integer

Week-4	CONDITIONAL STATEMENTS

1.A multinational company has developed a multi-criteria evaluation system to automate candidate shortlisting. For a given applicant, the system records the following:

- score (integer): Test score (out of 100)
- exp (integer): Years of experience
- tier (integer): Tier of college (1 – Top, 2 – Mid, 3 – Other)

Based on the inputs, classify the candidate:

Logic:

- If score < 50 → "Rejected: Failed Assessment"
- Else if score ≥ 50:
  - If exp = 0 AND tier = 3 → "Rejected: Fresh from Tier 3"
  - If exp < 2 AND score < 75 → "Waitlist: Needs More Experience"
  - If tier = 1 AND score ≥ 90 → "Accepted: Fast Track"
  - If score ≥ 70 AND (exp ≥ 2 OR tier = 1) → "Accepted: Standard Track"

- Otherwise → "Waitlist: Borderline Profile"

2. A company tracks the monthly sales performance of its three regional branches: North, South, and East.You are tasked to:

- Accept the sales (in rupees) of each branch
- Determine which branch had the highest sales
- If two or more branches have the same highest sales, print: "Tie"
- Otherwise, print the name of the branch with the highest sales

Week-5	LOOPING STATEMENTS

1.A smart city dashboard is simulating population growth over a number of years. The logic is adaptive:

- You are given:
  - Initial population (positive integer)
  - Growth rate percentage (float)
  - Number of years to simulate (integer)
- For each year:
  - Population increases by the growth rate on the current year's population
  - If in any year, the population crosses 1 million, stop simulation and print Population Limit Reached at Year X

Required:

- Print population year-wise up to the given year OR until the limit is reached.
- Output rounded to nearest integer.

2.You're working on an authentication layer for a secure login system. It accepts a number and does the following:

- Reverse the number using a loop
- Check:
  - If the number and reverse are equal → Palindrome
  - If the difference between number and its reverse is divisible by 11 → Near Palindrome

- Otherwise → Not a Palindrome

Week-6	NESTED LOOPING STATEMENTS

1. You're building the seat map logic for a railway reservation system. Each compartment has:

- r rows
- c columns
- A few reserved seats (you'll receive their positions)
- You must generate a grid where:
  - R = Reserved seat
  - A = Available seat
- Rows are labeled from 1 to r
- Columns from 1 to c

2. In a warehouse, items are stacked in a number pyramid to maximize space. Each row has more boxes than the last.

You are given the number of rows n, and your system must:

- Print the item ID starting from 1001 and increasing across rows
- Format the rows like a pyramid — each row contains i items in row I

Week-7	ARRAYS

1. A warehouse stores product IDs in an inventory list.

You are required to:

- Accept n product IDs (integers) into an array
- Accept one search ID
- Check whether that ID exists in the array
- If found, print its position (starting from 1)
- If not found, print "Not Available"

2.A smart building tracks temperature across multiple rooms using a **square grid of sensors**.

You are given:

- Two square matrices `A` and `B` of size `n × n`, where each element represents the temperature reading of a room at **two different times**.

You must:

1. Read both matrices
2. Compute a **third matrix C**, where each element is:
    - The **maximum** of the corresponding values in A and B

    (i.e., latest temperature reading per room)
3. Print the final matrix C row by row.

Week-8	FUNCTIONS

1.You are building a backend evaluation service for a university grading server that computes factorials for different modules.

- The system offers two modes of evaluation:
    1. Recursive mode – used by the Mathematics Department
    2. Non-recursive mode – used by the Physics Department
- Your job is to:
    - Accept a student ID and module code (MATH or PHYS)
    - Accept an integer n ($0 \leq n \leq 20$)

- Use:
  - Recursive function if module is MATH
  - Non-recursive function if module is PHYS
- Output the factorial result (only the number)

The server does not print the method used — it only returns the final number. The complexity lies in your logic to select and compute the factorial correctly based on module.

2.You are developing a C-based control system that supports power and GCD calculations for signal processing in embedded hardware.

- The system receives:
  - a, b, c — all positive integers ≤ 100
- You must:
  1. Compute a^b using a custom power function (non-library)
  2. Compute GCD of b and c using recursion
- Output the power and GCD on two separate lines

No status messages or logic branching is shown — just exact numbers. Internally though, students must build and invoke multiple functions appropriately.

Week-9	**STRINGS**

1. In a multi-cloud setup, user IDs are fetched from different cloud providers. These IDs are inconsistent in format and need normalization before merging.

You are asked to design a function that does the following:

- Accept one user ID string (mixed case, up to 100 characters)
- Convert all letters to **lowercase**
- If the string contains more than 12 characters, **truncate it to 12 characters**
- Print the normalized user ID

2. In a dual-environment (production and testing) login system, credentials are fetched from two different databases. You need to ensure that both IDs match **exactly**, or raise an alert.

Your task:

- Accept two user ID strings
- Compare them using a case-sensitive match
- If they are equal, access is granted
- If not, deny access and alert

Week-10	POINTERS

1. An embedded serial buffer receives n integer bytes. Due to a wiring issue, the last received byte appears first, and the rest in reverse. Your job is to:

- Accept the n integers using a pointer
- Reverse the array using pointer arithmetic (no array indexing allowed)
- Output the corrected stream

2. A hardware diagnostic utility reads two system boot values (`a` and `b`) from memory. Before system startup, these values must be swapped for security validation.

The utility performs:

- Dynamic memory allocation for both values
- Swapping using **only pointers**
- Then prints the updated values in the new memory locations

Week-11	STRUCTURES

1. A satellite sends two 2D signal points from its tracking system. Each signal point has:

- x coordinate (int)
- y coordinate (int)

You must:

- Store both signal points using a structure
- Calculate:
  - Midpoint of the two coordinates
  - Distance between the points
  - If distance > 100 → "Signal Drift Detected"
  - Else → "Signal Stable"

2. A multinational corporation wants to audit salary data for HR, TECH, and OPS departments using a structured system.

Each employee record includes:

- ID (int)
- Name (string)
- Department (string)

- Basic, HRA, DA (float)

You must:

- Accept records for `n` employees
- Compute gross salary
- Apply tags based on rules:
  - If gross > 80000 and department = TECH → `High Tech Earner`
  - If gross < 30000 and department = OPS → `Review Required`
  - If HRA > 50% of basic → `HRA Flagged`
- Print all tags for each employee if applicable

Week-12	**FILE HANDLING**

1.An enterprise app stores user activity logs in a file called activity.txt. Each line records: <user_id> <event_code> <status>

You are required to:

- Read all lines from the file
- Count the number of events with status "FAIL"
- Print the **total number of lines** and **number of failures**

2. A university system maintains student records in a file named students.txt. Each line contains: <student_id> <name> <subject_code> <mark>

The audit system performs:

1. Reads all student records from the file
2. Validates that mark is between 0 and 100 (skip invalid lines)
3. Classifies passed students (mark ≥ 50) into:
   - Excellent if mark ≥ 85
   - Good if 70 ≤ mark < 85
   - Average if 50 ≤ mark < 70
4. Writes only **passed students** and their **grade band** to a new file report.txt
5. Displays how many students fall into each band

Text Books:

1) Riley DD, Hunt K.A. Computational Thinking for the Modern Problem Solver. CRC press, 2014 Mar 27.

2) B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition) Yashavant Kanetkar, "Let Us C", BPB Publications, New Delhi, 13th Edition, 2012.

Reference Books:

1) Ferragina P, Luccio F. Computational Thinking: First Algorithms, Then Code. Springer; 2018
2) King KN, "C Programming: A Modern Approach", Atlantic Publishers, 2nd Edition, 2015.
3) Kochan Stephen G, "Programming in C: A Complete Introduction to the C Programming Language", Sam's Publishers, 3rd Edition, 2004.
4) Linden Peter V, "Expert C Programming: Deep C Secrets", Pearson India, 1st Edition, 1994.

Web References:

1. http://www.sanfoundry.com/c-programming-examples
2. http://www.geeksforgeeks.org/c
3. http://www.cprogramming.com/tutorial/c

ENGLISH LANGUAGE AND COMMUNICATION SKILLS (ELCS) LAB R25

I Year B. Tech								
Course Code:	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
A7HS02	**HSC**	**L**	**T**	**P**	**1**	**CIA**	**SEE**	**TOTAL**
		0	**0**	**2**		**40**	**60**	**100**
Contact Classes:12	**Tutorial Classes: 0**	**Practical Classes: 24**				**Total Classes: 24**		

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 expose students to varied listening materials in English, including native speaker audio inputs, with the aim of improving their concentration, comprehension, and interpretive skills.
2. To provide practice-oriented training in spoken English focusing on pronunciation, stress, and intonation patterns through both structured tasks and spontaneous speaking opportunities.
3. To develop students' reading comprehension abilities by introducing a range of texts and training them in effective reading strategies such as skimming, scanning, and critical analysis.
4. To enhance students' writing skills by engaging them in academic and professional writing tasks that focus on clarity, coherence, grammar, and appropriate formatting.

Course Outcomes:

Students will be able to:

1. Demonstrate improved listening skills and comprehend English spoken in native accents with enhanced focus and accuracy.
2. To apply appropriate pronunciation, intonation, and stress patterns while speaking English through participating in structured and spontaneous speaking activities.
3. Interpret and analyze a variety of written texts accurately using effective reading strategies.
4. Compose clear, coherent, and grammatically correct written texts for academic and professional purposes.

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 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

i) Computers with Suitable Configuration

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).

References:

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.

*** *** ***

ORDINARY DIFFERNTIAL EQUATIONS AND VECTOR CALCULUS - R25

I Year II Semester

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A7BS02	BSC	3	0	0	3	40	60	100
Contact Classes: 48	Tutorial Classes: 08	Practical Classes: Nil				Total Classes: 56		

Course Objectives: To learn

1. Methods of solving first order ordinary differential equations.
2. Methods of solving higher order ordinary differential equations.
3. Solving ordinary differential equations using Laplace transform techniques.
4. The physical quantities involved in engineering field related to vector valued functions.
5. 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

1. Determine whether the given differential equation of first order is exact or not.
2. Solve higher order differential equations and apply the concept of differential equations to real world problems.
3. Evaluate Ordinary differential equations using Laplace transforms.
4. Compute the gradient of a scalar field and evaluate directional derivatives at given points.
5. Evaluate the Line, Surface and Volume integrals and converting them from one to another.

UNIT-I	FIRST ORDER ORDINARY DIFFERNTIAL EQUATIONS	Classes: 08

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 DIFFERNTIAL EQUATIONS OF HIGHER ORDER	Classes: 10

Higher 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 $x\,V(x)$ – Method of variation of parameters.

UNIT-III	LAPLACE TRANSFORMS	Classes:10

Laplace Transforms: Laplace Transform of standard functions – First shifting theorem – Laplace transforms of functions multiplied by 't' and divided by 't' – Laplace transforms of derivatives and integrals of function – Evaluation of improper integrals by Laplace transforms – Laplace transform of periodic functions – Inverse Laplace transforms - partial fractions, First shifting theorem, derivatives and integrals,, convolution theorem. Applications: solving Initial value problems of ODE by Laplace

transform method (All theorems / Properties without proof).		
UNIT-IV	**VECTOR DIFFERENTIATION**	**Classes: 10**
Vector point functions and scalar point functions – Gradient – Directional derivatives - Divergence and Curl — Solenoidal and Irrotational vectors - Scalar potential functions –Vector operators and Identities.		
UNIT-V	**VECTOR INTEGRATION**	**Classes: 10**
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 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, LaxmiPublications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

Web references:

1. https://www.efunda.com/math/math_home/math.cfm
2. https://www.ocw.mit.edu/resources/#Mathematics
3. https://www.sosmath.com/
4. https://www.mathworld.wolfram.com/

E -Text Books:

1.https://www.e-booksdirectory.com/details.php?ebook=10166

MOOCS Course:

1. https://swayam.gov.in/
2. https://onlinecourses.nptel.ac.in/

ENGINEERING CHEMISTRY R25

I B. TECH- I/II SEMESTER:

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A7BS10	BSC	3	0	0	3	40	60	100
Contact Classes:50	Tutorial Classes: 0	Practical Classes: 0				Total Classes: 50		

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	CLASSES: 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.

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**	**CLASSES: 11**

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.

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**	**CLASSES: 11**

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.

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).

UNIT-IV	**POLYMERIC MATERIALS**	**CLASSES: 09**

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**	**CLASSES: 09**

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: https://archive.org/details/EngineeringChemistryByShashiChawla/page/n11/mode/2

ELECTRONIC MEASUREMENTS AND SENSORS							
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
A7EC03	**ESC**	3	0	0	3	40	60	100

COURSEOBJECTIVES:

After going through this course the student will be able to

1. Apply knowledge of electronic instruments for measurement of electrical quantities.
2. Know the principles and operations of instruments.
3. Select and use latest hardware for measurements.
4. Identify the various instruments for various measurements
5. Use the instruments in laboratory and real life

COURSEOUTCOMES:

Up on successful completion of the course, the student is able to

1. Apply knowledge of electronic instruments for measurement of electrical quantities.
2. Understand the concepts of digital instruments.
3. Understand the working principles of various oscilloscopes and measuring instruments.
4. Apply bridge circuits and transducers for practical measurement tasks in electrical and electronic instrumentation systems.
5. Analyze the applications of various sensors.

UNIT-I	MEASUREMENT CONCEPTS	*Classes:10*

Measurement concepts: Performance Characteristics-Static and dynamic characteristics , Types of errors in measurements, Accuracy and precision, Statistical analysis, Moving coil, Moving iron types Instruments ,DC Ammeter , DC Voltmeter & Calibrations.

UNIT-II	DIGITAL INSTRUMENTS AND SIGNAL GENERATORS	Classes:08

Digital instruments: Digital multi-meters, Digital frequency meter, Digital tacho meter, Digital PH meter, Digital phase meter, Microprocessor based Instruments & IEEE 488 bus.
Signal generators: Function generators, Pulse and square wave generators, RF signal generators.

UNIT-III	CATHODERAY OSCILLOSCOPES AND MEASUREING INSTRUMENTS	Classes:09

Cathode ray oscilloscopes: Basic block diagram of CRO, Features of CRT, Triggered sweep CRO, Dual beam CRO, dual trace CRO, digital storage oscilloscope (DSO).
Measuring instruments: Introduction, field strength meter, Q- meter, Transistor tester.

UNIT-IV	BRIDGES	Classes:09

Introduction to bridges, LCR Bridge Wheatstone's bridges for resistance measurements-Maxwell's bridge for inductance measurements, Schering's bridge for capacitance measurements measurement, Application of Bridges.

UNIT-V	SENSORS	Classes:10

Basic of Sensors, Characteristics of Sensors**,**Classification: Active Sensors: Thermocouples, Piezoelectric, Pyroelectric sensors, IR Sensors, Ultrasonic Sensors
Passive Sensors: Thermistor, Capacitive humidity sensors, LVDT (Linear Variable Differential Transformer), DHT 11 Sensor.

TextBooks:

1. Albert D.Helfrick and William D.Cooper – Modern Electronic Instrumentationand MeasurementTechniques, Pearson / Prentice Hall of India, 2007.
2. Electronic Instrumentation and Measurements by H. S. Kalsi — 4th Edition (published 2019

ReferenceBooks:

1. JosephJ.Carr,ElementsofElectronicsInstrumentationandMeasurement,Pearso n cation,2003.
2. Alan.S.Morris,PrinciplesofMeasurementsandInstrumentation,2ndEdition,Pren tice ofIndia,2003.
3. DavidA.Bell,ElectronicInstrumentationandmeasurements,PrenticeHallofIndiaPvtLtd, 2003.
4. B.C.NakraandK.K.Choudhry,Instrumentation,MeasurementandAnalysis,2ndEdition,TMH, 2004.
5. James W. Dally, William F. Riley, Kenneth G. McConnell, Instrumentation for EngineeringMeasurements,2nd Edition, John Wiley, 2003

WEB REFERENCES:

1.https://www.sciencedirect.com/science/book/9780123819604
2.https://www.schneider-electric.com/en/.../86485-measurement-and-instrumentation/

E-TEXT BOOKS:

1. https://books.google.co.in/books/about/Electronics_Measurements_And_Instrumenta.html?id=mxVRJRYCi-QC
2. https://sway.com/V1Uclj1JCiLhqcCb

MOOCS COURSE

1. https://www.schneider-electric.com/en/.../86485-measurement-and-instrumentation/
2. https://www.schneider-electric.com/en/.../86485-measurement-and-instrumentation/
3. https://www.coursera.org/courses?query=measurements%20and%20instrumentat

ENGINEERING WORKSHOP							R25
I B. TECH- I/II SEMESTER:							
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**	
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
A7ME03	**BSC**	0	0	2	1	40	60	100
Contact Classes:50	**Tutorial Classes: 0**	**Practical Classes: 0**				**Total Classes: 50**		

Prerequisites: Practical skill

COURSE OBJECTIVES:

1. To introduce students to basic manufacturing processes and workshop practices.
2. To provide hands-on training in carpentry, fitting and sheet metal.
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:

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

UNIT-I	**TRADES FOR EXERCISES**	**CLASSES: 10**

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 L - fit
iii. Tin Smithy: Square Tin, Rectangular Tray and Conical Funnel
iv. Soldering: Parallel and Series, Wheat stone bridge circuit.
v. House wiring: Parallel and Series, Two-way Switch and Tube Light

UNIT-II	TRADES FOR DEMONSTRATION AND EXPOSURE:	**CLASSES: 11**

Black Smithy: Round to Square and S – Hook Plumbing: PVC Pipe Fittings

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.

REFERENCE BOOKS:

1. Workshop Manual, K. Venugopal, Anuradha Publications, 2012th edition, 2012.

ENGINEERING CHEMISTRY LAB SYLLABUS R25

I B. TECH- I/II SEMESTER:

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A7BS11	BSC	0	0	2	1	40	60	100
Contact Classes:12	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

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

List of Experiments:

I. Water Analysis:

1. Estimation of Hardness of water by EDTA Complexometry method.
2. Determination of Alkalanity of given water sample.

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 $KMnO_4$.
2.

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).

DATA STRUCTURES Using C

de	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
	PCC	3	0	0	3	40	60	100

)BJECTIVES:

part the basic concepts of structures, pointers and data structures.
derstand concepts linked lists and their applications.
derstand basic concepts about stacks, queues and their applications.
derstand basic concepts of trees, graphs and their applications.
able them to write algorithms for sorting and searching

)UTCOMES:

)f the course, student will be able to:

e arrays, pointers and structures to formulate algorithms and programs.
sign and implement applications of Linked List.
sign and implement Stack ADT using Array and Linked List.
sign and implement Queue ADT using Array and Linked List.
lve problems involving graphs and trees.
alyze searching and sorting techniques based on time and space complexity.

	INTRODUCTION TO DATA STRUCTURES	Classes:09

n to Structures - Structure definition, initialization, accessing structures, nested structures, ructures, structures and functions, self-referential structures, Pointer – Basics, Pointer to

n to Data Structures- Definition, Linear Data Structures, Non-Linear Data Structures, on of single, two dimensional arrays, sparse matrices and their representation.

	LINKED LIST	Classes:09

ed Lists-Operations-Insertion, Deletion, Concatenating singly linked lists, Circularly linked ions-Insertion, Deletion, Doubly Linked Lists- Operations- Insertion, Deletion.

	STACKS	Classes:09

k ADT, definition, operations, array and linked implementations in C,
s-infix to postfix conversion, Postfix expression evaluation, recursion implementation

	QUEUES	Classes:09

eue ADT, definition and operations ,array and linked Implementations in C, Circular queues-inked implementations in C, Dequeue (Double ended queue)ADT, array and linked ions in C.

	SEARCHING & SORTING AND NON-LINEAR DATA STRUCTURES	Classes:09

Linear Search, Binary Search, **Sorting**- Bubble Sort, Insertion Sort, Selection Sort, Quick Sort, Comparison of Sorting methods.

Data Structures-Trees – Introduction, Definition, Terminology, Applications, Tree ons- List Representation, Left Child – Right Sibling Representation. **Graphs** - Introduction, Terminology, Applications, Graph Representations- Adjacency matrix, Adjacency lists

gurusamy, "Programming in ANSI C", McGraw Hill Education, 6th Edition, 2012.
mentals of Data Structures", Illustrated Edition by Ellis Horowitz, SartajSahni, Computer Press.
ructures using C, R.Thareja 2nd Edition, Oxford Pres0073

ooks:

s, Data Structures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Wesley Publishing Company
olve it by Computer", 2nd Impression by R. G. Dromey, Pearson Education

ERENCES:

ackr.io/tutorials/learn-data-structures-algorithms
ww.geeksforgeeks.org/fundamentals-of-algorithms/
ww.udemy.com/introduction-to-algorithms-and-data-structures-in-c/
etcode.com

OOKS:

w.freetechbooks.com/algorithm-analysis-and-design-t1030.html
w.freetechbooks.com/algorithmic-problem-solving-t373.html
v.freetechbooks.com/algorithms-and-data-structures-the-basic-toolbox-t871.html

COURSE

ww.coursera.org/specializations/data-structures-algorithms
nlinecourses.nptel.ac.in/noc16_cs06/preview

NETWORK ANALYSIS & SYNTHESIS

I B. Tech II Sem (R25)

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	TOTAL
A7EE07	ESC	3	0	0	3	40	60	100
Contact Classes:0	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

Course Objectives:

1. To understand the basic concepts on RLC circuits.
2. To know the behaviour of the steady state and transient states in RLC circuits.
3. To understand the two port network parameters.
4. Learn the design concepts of various filters and attenuators

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

1. Gain the knowledge on basic RLC circuits behaviour.
2. Analyse the Steady state and transient analysis of RLC Circuits.
3. Characterization of two port network parameters.
4. Analyse the Design aspect of various filters and attenuators

UNIT-I : NETWORK TOPOLOGY

Graph, tree, chord, Tie-set, cut-set, incident matrix, Problems on Tie-set and cut-set.

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

UNIT-II: TRANSIENT ANALYSIS

Transient response of R, L & C circuits, Formulation of integral differential equations, Initial conditions, Transient Response of RL, RC and RLC (series and parallel) networks- Response to step and sinusoidal excitations.

UNIT-III: TWO PORT NETWORKS

Two port networks, impedance, admittance, transmission parameters, hybrid and inverse hybrid parameters, relationships between parameters, conditions for symmetry and reciprocity.

UNIT-IV: 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 cauer methods.

UNIT–V: FILTERS

Classification of filters – Low pass, High pass, Band pass and Band Elimination, Constant-k and M-derived filters-Low pass and High pass Filters, Band pass and Band elimination filters (Elementary treatment only).
TEXT BOOKS:
1.Van Valkenburg – Network Analysis, 3rd Edition Pearson, 2016. 2.JD Ryder - Networks, Lines and Fields, 2nd Edition PHI, 1999.
REFERENCE BOOKS:
1. J. Edminister and M. Nahvi - Electric Circuits, Schaum's Outlines, Mc Graw Hills Education,1999. 2. A. Sudhakar and Shyam mohan S Palli-Networks&Circuits,4thEdition TataMcGraw-Hill Publications

APPLIED PYTHON PROGRAMMING LAB R 25

I B. TECH- I/II SEMESTER:

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
A7EC04	BSC	0	0	2	1	40	60	100
Contact Classes:12	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

Course Outcomes:

Upon completing this course, the students will be able to

1. Build basic programs using fundamental programming constructs
2. Write and execute python codes for different applications
3. Capable to implement on hardware boards

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	1	1	1	1	-	-	1	-	1	1
CO2	2	3	2	1	1	2	-	-	1	-	1	1
C03	2	3	2	1	1	2	-	-	1	-	1	1

LIST OF EXPERIMENTS

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.pythonguide.
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/(2s2))/sqrt(2π)s that computes the Normal distribution

4. The package numpy

a) Creating a matrix of given order m x 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
c) Downloading an Image
d) Writing the image to an SD card
e) using Linux
f) using Windows
g) 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 USING C LAB

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A7CS64	ESC	-	-	2	1	40	60	100

COURSE OBJECTIVES:

The course should enable the students to:

1. Ability to identify the appropriate data structure for given problem.
2. Effectively use compilers include library functions, debuggers and troubleshooting.
3. Write and execute programs using data structures such as arrays, linked lists to implement stacks, queues.
4. Write and execute programs in C to implement various sorting and searching.

COURSE OUTCOMES:

The course should enable the students to:

1. Use appropriate data structure for given problem.
2. Use compilers include library functions, debuggers and troubleshooting.
3. Execute write programs in C to implement various types Linked Lists.
4. Execute programs using data structures such as arrays, linked lists to implement stacks.
5. Execute programs using data structures such as arrays, linked lists to implement queues.
6. Execute write programs in C to implement various sorting and searching.

LIST OF EXPERIMENTS

WEEK-1 STRUTCURES

Write a C Program using functions to

a. Reading a complex number
b. Writing a complex number
c. Add two complex numbers
d. Multiply two complex numbers

Note: represent complex number using structure

WEEK-2 ARRAYS

1. Write a C program
   I. To add two matrices
   II. To multiply two matrices
2. Write a C program to implement Sparse Matrices.

WEEK-3 SINGLE LINKED LIST

Write a C program that uses functions to perform the following:

a. Create a singly linked list of integers.
b. Delete a given integer from the above linked list.
c. Display the contents of the above list after deletion.

WEEK-4	SINGLE LINKED LIST
Write a C program that uses functions to perform the following: a. Create TWO singly linked list of integers. b. Concatenate TWO Singly Linked Lists. **c.** Display the contents of the above list after concatenation	
WEEK-5	**DOUBLE LINKED LIST**
Write a C program that uses functions to perform the following: a. Create a doubly linked list of integers. b. Delete a given integer from the above doubly linked list. c. Display the contents of the above list after deletion	
WEEK-6	**STACK**
Write C programs to implement a Queue ADT using i) array ii) linked list	
WEEK-7	**STACK APPLICATION**
a. Write a C program that uses stack operations to convert a given infix expression into its postfix Equivalent, Implement the stack using an array. **b.** Write a C program that uses Stack to evaluate Postfix Expression.	
WEEK-8	**QUEUE**
Write C programs to implement a Queue ADT using i) array ii) linked list	
WEEK-9	**DOUBLE ENDED QUEUE**
Write C programs to implement a double ended queue ADT using i) array **ii)** doubly linked list	
WEEK-10	**SEARCHING**
Write C programs for implementing the following searching methods: a) Linear Search b) Binary Search	
WEEK-11	**SORTING**
Write C programs for implementing the following sorting methods to arrange a list of integers in Ascending order : a) Insertion sort b) Merge sort	
Week-12	**SORTING**
Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Quick sort b) Selection sort	
TEXT BOOKS	
1. C and Data Structures, Prof. P.S. Deshpande and Prof. O.G. Kakde, Dreamtech Press. 2. Data structures using C, A.K.Sharma, 2nd edition, Pearson. **3.** Data Structures using C, R.Thareja, Oxford UniversityPress.	

WEB REFERENCES

1. http://www.sanfoundry.com/data_structures-examples
2. http://www.geeksforgeeks.org/c
3. http://www.cs.princeton.edu

ELECTRICAL ENGINEERING LABORATORY (ECE)

I B. Tech II Sem(R25)

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	TOTAL
A7EE08	ESC	0	0	2	1	40	60	100
Contact Classes:12	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

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

1. Analyze the circuit using Kirchhoff's law and network simplification theorems
2. Evaluate the efficiency of single-phase Transformer
3. Evaluate the efficiency and critical speed and critical field resistance of DC Machine
4. Evaluate the efficiency of AC Machine

List of experiments/demonstrations:

PART- A (Compulsory)

1. Verification of KVL and KCL
2. Verification of Thevenin's theorem
3. Verification of Norton's theorem
4. Resonance in series RLC circuit
5. Maximum Power Transfer Theorem
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. Magnetization characteristics of DC Shunt Generator.
3. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
4. Measurement of Active 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. M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012 3. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021. 4. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011. 5. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010. 6. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989. 7. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009

II B. Tech I Sem							(R25)	
Course Code	**Category**	**Hours/ Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**TOTAL**
A7EC09	**ESC**	3	0	0	3	40	60	100
Contact Classes:50	**Tutorial Classes: 0**	**Practical Classes: 24**				**Total Classes: 24**		

Course Objectives:

1. Thisgivesbasicunderstandingofrandomvariablesandoperationsthatcanbeperforme donthem.
2. To known the Spectral and temporal characteristics of Random Process.
3. To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics.

Course Outcomes:

Upon completing this course, the student will be able to

1. Perform operations on single and multiple Random variables.
2. Determine the Spectral and temporal characteristics of Random Signals.
3. Characterize LTI systems driven by stationary random process by using ACFs and PSDs.
3. Understand the concepts of Noise and Information theory in Communication systems.

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	-	2	-	-	-	-	-	-	-	-
CO2	3	3	-	2	-	-	-	-	-	-	-	-
C03	3	3	3	2	-	-	-	-	-	-	-	-
C04	3	3	3	2	-	-	-	-	-	-	-	-

UNIT-I : PROBABILITY:

Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay's Theorem, Independent Events. Random Variables- Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties

UNIT-II: OPERATIONS ON SINGLE RANDOM VARIABLE

T operations on single Random Variable Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable - Monotonic and Non-monotonic Transformations of Continuous and Discrete Random Variable, Computer generation of a Random Variable of a given PDF/CDF.

UNIT-III: Multiple random variables and Operations on Multiple random variables:

Multiple random variables and Operations on Multiple random variables: Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density– Point and Interval conditioning, Statistical Independence, Sum of Two and more Random Variables, Central Limit Theorem, Equal and Unequal Distribution (Proof not expected).

Expected Value of a Function of Random Variables- Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables

UNIT-IV: RANDOM PROCESSES – TEMPORAL CHARACTERISTICS:

Random processes – Temporal characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide- Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and

Ergodicity, Mean- Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross- Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

UNIT–V: RANDOM PROCESSES – SPECTRAL CHARACTERISTICS:

Random processes – Spectral characteristics: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

Noise sources: Resistive / Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its

TEXT BOOKS:

1. Peyton Z. Peebles - Probability, Random Variables & Random Signal Principles - TMH, 4th Edition
2. Murray R Spiegel, John Schiller, R Alu Srinivasan. – Probability and Statistics – Schaum's Outlines, 2nd Edition, TMH
3. JD Ryder - Networks, Lines and Fields, 2nd Edition PHI, 1999.

REFERENCE BOOKS:

1. P Ramesh Babu - Probability Theory and Random Processes – McGraw Hill Education
2. Athanasios Papoulis and S. Unnikrishna Pillai - Probability, Random Variables and Stochastic
Processes – McGraw Hill Education, 4th Edition
3. K. N. Hari Bhat, K. Anitha Sheela and Jayant Ganguly - Probability Theory and Stochastic Processes for Engineers - Pearson, 1st Edition, 2011
4. Taub and Schilling - Principles of Communication systems by (TMH), 2008
5. Y Mallikarjuna Reddy - Probability Theory and Stochastic Processes, 4th Edition, University Press

SIGNALS AND SYSTEMS	
I B. Tech II Sem	(R25)

Course Code	Category	Hours/ Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	TOTAL
A7EC06	PCC	3	0	0	3	40	60	100
Contact Classes:48	Tutorial Classes: 12	Practical Classes: 24				Total Classes: 24		

Pre-Requisites: Mathematics

Course Objectives:

This subject gives the basics of Signals and Systems required for all Electrical Engineering related courses. The objectives of this subject are to:

1. Classify signals and systems and their analysis in time and frequency domains.
2. Study the concepts of distortion less transmission through LTI Systems, convolution and correlation properties.
4. Understand Laplace and Z-transforms their properties for analysis of signals and systems.
5. Identify the need for sampling of CT signals, types and merits and demerits of each type.

Course Outcomes:

Upon completing this course, the student will be able to:

1. Characterize various signals, systems and their time and frequency domain analysis, using transform techniques.
2. Identify the conditions for transmission of signals through systems and conditions for physical realization of systems.
3. Understand the significance of sampling theorem for baseband and band pass signals for various types of sampling and for different duty cycles.
4. Understand the concept of correlation and PSD functions and their applications.

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-
C03	3	3	2	2	-	-	-	-	-	-	-
C04	3	3	2	2	-	-	-	-	-	-	-

UNIT-I : SIGNAL ANALYSIS

Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

UNIT-II: FOURIER SERIES:

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum. Fourier Transforms: Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of

Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

UNIT-III: SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS:

Linear System, Impulse response, Response of a Linear System, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution. Extraction of Signal from Noise by Filtering. Linear Time Invariant (LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization,
Relationship between Bandwidth and risetime. Extraction of Signal from Noise by Filtering.

UNIT-IV: LAPLACE TRANSFORMS:

Laplace Transforms: Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis. Correlation: Auto Correlation and Cross Correlation Functions, Relation between Convolution and Correlation, Properties of Correlation Functions, Energy Density Spectrum, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Parseval's
Theorem, Detection of Periodic Signals in the presence of Noise by Correlation..

UNIT–V: SAMPLING THEOREM::

Sampling theorem: Graphical and analytical proof of Sampling Theorem for Base band/Band Limited and Band Pass Signals, Types of Sampling: Impulse Sampling, Natural and Flattop Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Z–Transforms: Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

TEXT BOOKS:

1. Signals, Systems & Communications -B.P. Lathi, BS Publications.
2. Signals and Systems – Allan. V. Oppenheim, Allan. S. Willsky with S. Hamid. Nawab, 2nd Ed.Pearson.

REFERENCE BOOKS:

1. Signals and Systems–Simon Haykin, Barry Van Veen, 2nd Ed., Wiley.
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH.
3. Fundamentals of Signals and Systems – Michel J. Roberts, Govind Sharma, 2nd Ed., MGH.
4. Signals, Systems and Transforms - Charles. L. Philips, John M. Parr and Eve A. Riskin, 4th Ed., 2004, Pearson, Prentice Hall.

ELECTRONIC DEVICES AND CIRCUITS

B.Tech. II Year I Sem.

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	TOTAL
A7EC05	PCC							

		3	0	0	3	40	60	100
Contact Classes:48	**Tutorial Classes: 8**	**Practical Classes: 24**				**Total Classes: 24**		

Course Overview:

This course introduces fundamental semiconductor devices and their behavior, Including diodes, BJTs, and FETs. It covers their characteristics, applications, and the analysis of basic electronic circuits. The course also explores rectifiers, voltage regulation, amplifier design, and advanced semiconductor technologies like FinFETs and CNTFETs. Emphasis is placed on
developing a strong foundation for analog circuit design and understanding modern device technologies in electronics.

Course Outcomes:

By the end of this course, students will be able to:
CO1: Analyze the electrical characteristics and models of semiconductor diodes and apply them in rectifier and clipping circuits.
CO2: Evaluate the operation and configurations of Bipolar Junction Transistors (BJTs) and analyze their input and output characteristics.
CO3: Design appropriate biasing networks for BJTs and determine the operating point for amplifier applications.
CO4: Analyze transistor amplifier circuits using h-parameter models and assess performance for various configurations.
CO5: Analyze the structure, working, and characteristics of JFETs, MOSFETs, and advanced devices like FinFETs and CNTFETs, and compare modern device technologies.
Course Articulation Matrix

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	2	2	1	1	-	-	-	-	-
CO2	3	3	2	2	1	-	-	-	-	-	-
C03	3	3	3	2	1	-	-	-	-	-	-
C04	3	3	3	2	2	-	-	-	-	-	1
C05	3	3	2	2	2	1	-	-	-	-	2

Syllabus:

UNIT - I:

Diode Characteristics and Applications: PN junction diode – I-V characteristics, Diode resistance and capacitance, Diode models (Ideal, Simplified, Piecewise Linear), Rectifiers – Half-wave, Fullwave (Center-tap and bridge), Capacitor filter for rectifiers, Clippers and clampers, Zener diode – I-V characteristics and voltage regulation.

UNIT - II:

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, Determination of h-parameters from transistor characteristics.

UNIT - III:

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:

Transistor Amplifiers: Transistor as a small-signal amplifier, h-parameter equivalent circuit, CE, CB, CC amplifier analysis using h-parameters, Approximate CE model – with and without emitter bypass capacitor.

UNIT - V:

Special Purpose Diodes: Principle of Operation of – SCR, Tunnel Diode, Varactor Diode, Photo Diode, Solar Cell, LED and Schottky Diode Field Effect Transistors and Advanced Devices: JFET: Structure, operation, and characteristics,
MOSFET: Enhancement and Depletion modes – Structure, operation, and characteristics, Advanced
Devices: FinFETs - 3D structure, Scaling advantages, CNTFETs - Structure, ballistic 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, 7thed., 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.
R25 B.Tech. ECE Syllabus JNTUH Hyderabad

DIGITAL LOGIC DESIGN

B.Tech. II Year I Sem

Course Code	Category	Hours/Week	Credits	Maximum Marks

A7EC08	PCC	L	T	P	C	CIE	SEE	TOTAL
		3	0	0	3	40	60	100
Contact Classes:48	Tutorial Classes: 08	Practical Classes: 24				Total Classes: 24		

Course Overview

This course introduces students to the fundamental principles of digital logic design. Starting from Boolean algebra and its simplification techniques, it covers the formal analysis and design of combinational and sequential circuits. Additionally, the course addresses memory elements and programmable logic devices, which are essential building blocks for complex digital systems.

Course Outcomes:

Upon completion, students will be able to:

CO1: Apply Boolean algebra and minimization techniques to simplify Boolean functions.
CO2: Design combinational circuits using logic gates.
CO3: Analyze latches and flip-flops to design sequential logic circuits.
CO4: Construct synchronous sequential circuits combining flip-flops and logic gates.
CO5: Utilize programmable logic devices in digital system design.

Course Articulation Matrix

Course	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	2	2	1	-	-	-	-	-	1
CO2	3	3	3	2	2	-	-	-	-	-	1
C03	3	3	3	2	2	-	-	-	-	-	1
C04	3	3	3	2	2	-	-	-	-	-	1
C05	3	2	3	2	3	-	-	-	-	-	2

UNIT – I:

Number Systems: Binary, Octal, Decimal, Hexadecimal, Fixed-point and Floating-point Number Representations, Complements of Numbers: 1's and 2's Complement, Error Detection and Correction Codes: Parity Check, Hamming Code. Boolean Algebra and Logic Gates: Axiomatic definitions, basic theorems and properties, Boolean Functions: Canonical and standard forms, Digital Logic Gates Overview.

UNIT - II:

Gate-Level Minimization Techniques: Karnaugh maps: 2, 3, and 4 variables, Sum-of-products (SOP) and product-of-sums (POS) simplification, Don't care conditions, Implementation using NAND and NOR gates.

UNIT - III:

Combinational Logic Circuits: Analysis and design procedures, Binary adder-subtractor and BCD adder, magnitude comparator, decoders, encoders, multiplexers and demultiplexers.

UNIT - IV:

Sequential Logic Circuits: Gated latches, Flip-flops: Clocked S-R, D, T, JK, Master-Slave JK,Design of synchronous and asynchronous counters, Shift registers: types and applications.

UNIT - V:
Synchronous Sequential Logic Moore and Mealy state machines, State diagrams, state tables, and state reduction, Case studies: sequence detector, traffic light controller, vending machine. Programmable Logic Devices: Memory devices - RAM, ROM, Programmable Logic Arrays (PLA), Programmable Array Logic (PAL)
TEXT BOOK:
1. M. Morris Mano, Michael D. Ciletti, Digital Design with an Introduction to the Verilog HDL, 6th Edition, Pearson Education/PHI, 2017. REFERENCE BOOKS: 1. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, Digital Systems: Principles and Applications, 10th Edition, Pearson Education. 2. Charles H. Roth Jr., Larry L. Kinney, Fundamentals of Logic Design, 6th Edition, Cengage Learning.

CONTROL SYSTEMS				
B.Tech. II Year I Sem				
Course Code	**Category**	**Hours/Week**	**Credits**	**Maximum Marks**

A7EC07	PCC	L	T	P	C	CIE	SEE	TOTAL
		3	0	0	3	40	60	100
Contact Classes:50	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

Prerequisite: Electrical Circuits-I & II and Electrical Machines-I

Course objectives:

1. Understand the mathematical modelling of physical systems.
2. Comprehend the representation of dynamical systems through input-output models, including transfer functions and state-space models.
3. Understand the design of controllers and compensators to enhance the performance and stability of dynamical systems

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

1. Find the transfer function and state-space representation of linear time-invariant dynamical systems.
2. Analyze the performance and stability of linear time-invariant systems in both time and frequency domains.
3. Study classical controllers/compensators to improve the performance and stability of linear

time-invariant systemrse Objectives	PROGRAM OUTCOMES											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Understand the mathematical modelling of physical systems.	3	3	3	3	3	-	-	1	-	-	2	2
Comprehend the representation of dynamical systems through input-output models, including Transfer functions and state-space models.	3	3	3	3	3	-	-	1	-	-	2	2
Understand the design of controllers and compensators to enhance the performance and stability of dynamical systems	3	3	3	3	3	-	-	1	-	-	2	2

Course Outcomes	PROGRAM OUTCOMES											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12

Find the transfer function and state-space representation of linear timeinvariant dynamical systems	3	3	3	3	3	-	-	1	-	-	2	2
Analyze the performance and stability of linear time-invariant systems in both time and frequency domains	3	3	3	3	3	-	-	1	-	-	2	2
Study the classical controllers/comp ensators to improve the performance and stability of linear time-invariant systems	3	3	3	3	3	-	-	1	-	-	2	2

UNIT - I:

Mathematical modelling of physical systems: Open – loop and Closed loop Systems, Concept of Feedback Control, Benefits of Feedback and Effects of feedback, Linear, Non-Linear, Time Variant and Time Invariant systems, Mechanical and Electrical Systems. Transfer function, Block-Diagram Techniques, Signal flow graph, Controller Components: DC Servo motors, AC Servomotors,Synchro's.

UNIT - II:

Time-Domain Analysis with Input-Output Models: Time response of first and second order systems for standard test inputs. Analysis of standard Second order systems with step input, Types of System, Error Analysis for Linear time Invariant Systems, Design specifications for second-order systems based on the time-response. Concept of Stability: Routh-Hurwitz Criteria. Relative Stability analysis, Root-Locus technique: Construction of Root-loci.

UNIT - III:

Frequency Domain Analysis: Introduction to frequency response, Relationship between time and frequency response, Concept of Bode plots and construction. Polar plots, Nyquist tability criterion. Relative stability using Nyquist criterion – gain and phase margin

UNT - IV:

Classical Controllers and Compensators: Proportional, Integral and Derivative Controllers-PI, PD and PID controllers, Lead, Lag and Lead-Lag compensators (elementary treatment only).

UNT - V:

State Variable Analysis: Concept of State, State variables and State model. State Representation,
Transformation of State variables, Solution of state equations and Complete response of the Systems. Concept of controllability and observability.

TEXT BOOKS:

1. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009.
2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.
3. Norman S Nise, "Control Systems Engineering", Wiley, 2019 8th Edition.

REFERENCE BOOKS:

1. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
2. K. R. Varmah, "Control Systems", McGraw Hill Education, 2010.

Online Recourses:

1. https://www.controleng.com
2. https://www.mathworks.com
3. https://nptel.ac.in/courses/108/102/108102043/

B.Tech. II Year I Sem								
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
A7HS08	**HSC**	**L**	**T**	**P**	**C**	**CIE**	**SEE**	**TOTAL**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Contact Classes:12	**Tutorial Classes: 0**	**Practical Classes: 24**				**Total Classes: 24**		

Course Objectives:

1. To familiarize on the basic concepts of innovation, entrepreneurship and its importance.
2. To Identify and analyze the process of problem-opportunity identification, market segmentation, and idea generation techniques.
3. To initiate prototype development and understand minimum viable product.
4. To develop initial Business and financial planning and Go-to-Market strategies
5. To impart knowledge on establishing startups, venture pitching and IPR

Course Outcomes:

1. Understand the entrepreneurship and the entrepreneurial process and its significance in economic development.
2. Assess the problem from an industry perspective and generate solutions using the design thinking principles.
3. Assess market competition, estimate market size, and develop a prototype.
4. Analyze Business and financial planning models and Go-to-Market strategies.
5. Able to build a start-up, register IP and identify funding opportunities.

Unit I: Fundamentals of Innovation and Entrepreneurship

Innovation: Introduction, need for innovation, Features, Types of innovations, innovations in manufacturing and service sectors, fostering a culture of innovation, planning for innovation. Entrepreneurship: Introduction, types of entrepreneurship attributes, mindset of entrepreneurial and intrapreneurial leadership, Role of entrepreneurs in economic development. Woman Entrepreneurship, Importance of on-campus startups. Understanding to build entrepreneurial mindset, attributes and networks individuals while on campus.
Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity.

Unit II: Problem and Customer Identification

Identification of gap, problem, analyzing the problem from a industry perspective, real-world problems, market and customer segmentation, validation of customer problem fit, Iterating problem-customer fit, Competition and Industry trends mapping and assessing initial opportunity, Porter's Five Force Model. Idea generation, Ideation techniques: Brainstorming, Brain writing, Round robin, and SCAMPER, Design thinking principles, Mapping of solution to problem. Core Teaching Tool: Several types of activities including: Class, game, Gen AI, 'Get out of the Building' and Venture Activity.

Unit III: Opportunity assessment and Prototype development

Identify and map global competitors, review industry trends, and understand market sizing: TAM, SAM, and SOM. Assessing scope and potential scale for the opportunity.
Understanding prototyping and Minimum Viable Product (MVP). Developing a prototype: Testing, and validation. Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

Unit IV: Business & Financial Models

Introduction to Business Model and types, Lean Canvas Approach: 9-block lean canvas model, building lean canvas for your startup. Business planning: components of Business plan- Sales plan, People plan and financial plan, Financial Planning: Types of costs, preparing a financial plan for profitability using a financial template, understanding the basics of Unit economics, Economies of Scale and analyzing financial performance. Go-To-Market (GTM) approach – Selecting the Right Channel, creating digital presence, and building customer acquisition strategy. Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities.

Unit V: Startups and IPR

Startup requirements, building founding team members and mentors, pitch preparation, start-up registration process, funding opportunities and schemes, institutional support to entrepreneurs, startup lifecycle, documentation, legal aspects in startup, venture pitching readiness, National Innovation Startup Policy (NISP) and its features.
Patents, Designs, Patentability, Procedure for grants of patents. Indian Scenario of Patenting, International Scenario: International cooperation on Intellectual Property. Patent Rights: Scope of Patent Rights. Copyright, trademark, and GI. Licensing and transfer of technology.
Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

Suggested Readings:

1. John R Bessant, Joe Tidd, Innovation and Entrepreneurship, 4E, Wiley, Latest Edition.
2. Ajay Batra, The Stratup Launch Book- A Practical Guide for Launching Customer Centric Ventures, Wiley, 2020. (For Core Teaching Tool).
3. Entrepreneurship Development and Small Business Enterprises, Poornima M Charantimath, 3E, Pearson, 2018.
4. D.F. Kuratko and T.V. Rao, Entrepreneurship: A South-Asian Perspective, Cengage Learning, 2013.
5. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.
6. NISP -Brochure inside pages - startup_policy_2019.pdf

MODELLING & SIMULATIONLAB

B.Tech. II Year I Sem

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	TOTAL
A7EC10	PCC	3	0	0	3	40	60	100
Contact Classes:12	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

Note:

All the experiments are to be simulated using MATLAB or equivalent software

Minimum of 12 experiments are to be completed / simulated.

Will be able to use a simulation tool for generating, analyzing and performing various operations on

Signals / Sequences both in time and Frequency domain

Will be able to use a simulation tool for Analyzing and Characterizing Continuous and Discrete

Time Systems both in Time and Frequency domain along with the concept of Sampling

Will be able to use a simulation tool for generating different Random Signals; analyze their Characteristics by finding different higher order Moments and noise removal applications

Will be able to use a simulink for Control System applications

List of Experiments:

Signals and Systems (Minimum 7 Experiments)

1. Write the code / script for generating various standard viz: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc and Nonstandard Signals and Sequences generated from these standard signals /sequences using Waveform synthesis. Also for perform different operations viz: Addition, Multiplication, Scaling, Shifting,

Folding, Computation of Energy and Average Power on them.

2. Write the code / script for finding the Even and Odd parts of Signal / Sequence and Real and Imaginary parts of Signal.

3. Write the code / script for finding the output of a System for a given input and Impulse Response and finding Auto Correlation and Cross Correlation of Signals / sequences

4. Write the code / script for Verifying whether a given Continuous/Discrete System is Linear, Time Invariant, Stable and Physically Realizable

5. Write the code / script for obtaining Sinusoidal response and Impulse response of a given Continuous / Discrete LTI System.

a) Plot the Real and Imaginary part and

b) Magnitude and Phase Plot of the response

6. Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Fourier Transform by using the properties where ever required.

7. Write the code / script for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Laplace Transform by using the properties where ever required. Also plot pole-zero diagram in S-plane

8. Write the code/ script for finding and plotting the Magnitude and Phase Spectrum of any

given Sequence by finding its Z-Transform by using the properties wherever required. Also plot pole – zero diagram in Z-plane
9. Design a Simulink or equivalent model for
a) Solving Differential Equations
b) Finding the response of any RLC Circuit with different initial Conditions for AC and DC inputs and plot the corresponding responses

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	2	3	3	3	2	-	-	3	1	-
CO2	3	2	3	3	3	2	-	-	3	1	-
C03	3	2	3	3	3	2	-	-	3	1	-
C04	3	2	3	3	3	2	-	-	3	1	-

10. Gibbs Phenomenon and waveform synthesis
Probability Theory and Stochastic Processes (Minimum 3 Experiments)
11. Write the code / script for generating various Random Variables with different CDFs/ PDFs
12. Write the code / script for generating Gaussian noise and for finding its mean, Skewness, Kurtosis, PDF and PSD.
13. Write the code / script for Verifying Sampling theorem for different sampling rates, Sampling types and Duty Cycles and for plotting the sampled and reconstructed Signals.
14. Write the code / script for Removal of noise from the signal using Cross correlation.
15. Write the code / script for Extraction of Periodic Signal masked by noise using Auto Correlation

Control Systems (Minimum 2 Experiments)

16. Build and Simulate a DC Motor using Simulink
17. Implementation of a PID Controller from equations using Simulink
18. Controllability and Observability
Note: For the experiments with code/scripts written in MATLAB or equivalent (1-8, 11-15), the student can design a user interface or app using MATLAB App Designer or equivalent.
Application on Real Time signals
1. Application of Autocorrelation: GPS Synchronization Satellite communication toolbox is required for this experiment. Generate the GPS signal. Visualize the GPS signal. Plot of autocorrelation of C/A code and visualize the spectrum of GPS signals. For exact steps, go through the following page: https://www.mathworks.com/help/satcom/ug/gps-waveform-generation.html
2. Sampling of Speech Signals Record and play speech in MATLAB. For steps, go through the following page:
https://in.mathworks.com/help/matlab/import_export/record-and-play-audio.html
Change the sampling rate of the recorded speech signal and play back to see the effect of aliasing. For steps, go through the following page:
https://in.mathworks.com/help/signal/ug/changing-signal-sample-rate.html

ELECTRONIC DEVICES AND CIRCUITS LAB

B.Tech. II Year I Sem. L T P C

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	TOTAL
A7EC11	PCC	3	0	0	3	40	60	100
Contact Classes:12	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

Course Overview:

This laboratory course aims to provide hands-on experience and simulation-based learning of semiconductor devices and basic electronic circuits. Students will analyze the characteristics and applications of diodes, BJTs, and FETs, design rectifiers and amplifiers, and simulate modern electronic circuits using software tools. The course bridges theoretical concepts with practical implementation, developing foundational skills essential for analog electronics and circuit analysis.

Course Outcomes (COs): By the end of this course, students will be able to:
CO1: Analyze the I–V characteristics of semiconductor devices such as diodes, BJTs, and FETs.
CO2: Design and evaluate basic rectifier, clipper, clamper, and voltage regulation circuits.
CO3: Demonstrate biasing techniques for BJTs and determine their operating point using DC load line
analysis.
CO4: Design and analyze transistor amplifier circuits in various configurations using h-parameter
models.
CO5: Simulate and interpret electronic circuits using appropriate simulation tools.
Course Articulation Matrix

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	2	2	1	-	-	-	-	-	-
CO2	3	3	3	2	1	1	-	-	-	-	-
C03	3	3	2	2	1	-	-	-	-	-	-
C04	3	3	3	2	1	-	-	-	-	-	1
C05	2	2	2	3	3	-	-	-	-	-	2

List of Experiments
A. Hardware-Based Experiments (7):
1. Study the I–V characteristics of a PN junction diode in forward and reverse bias to

determine cut-in voltage and dynamic resistance.
2. Examine the reverse bias characteristics of a Zener diode and demonstrate its application as a voltage regulator under varying conditions.
3. Design and analyze half-wave and full-wave rectifiers (center-tap and bridge) with and without capacitor filters to evaluate ripple factor and output voltage.
4. Implement clipper and clamper circuits to observe waveform shaping through positive, negative, and biased configurations.
5. Plot the input and output characteristics of a BJT in common emitter configuration to determine input/output resistance and current gain.
6. Design and test fixed bias and voltage divider bias circuits to establish a stable operating point for a BJT amplifier and study DC load line behavior.
7. Construct and analyze a Common Base (CB) configuration of a BJT to study input-output characteristics and determine current gain (α) and input/output resistance.

B. Software-Based Simulation Experiments (7):
1. Simulate a full-wave bridge rectifier with capacitor filter to analyze waveform smoothing and ripple reduction in DC power supply design.
2. Simulate a Zener diode-based voltage regulator to study voltage stabilization against varying supply voltages and load resistances.
3. Simulate a common emitter amplifier with and without emitter bypass capacitor to analyze the effect on voltage gain and signal amplification.
4. Simulate BJT operation as a switch and small-signal amplifier to understand its dual functionality in digital and analog applications.
5. Simulate the output and transfer characteristics of a JFET to determine parameters such as pinch-off voltage, drain resistance, and transconductance.
6. Simulate the characteristics of a MOSFET and design a CMOS inverter to study digital switching behavior and low-power logic design.
7. Simulate the transfer and output characteristics of an enhancement-mode NMOS transistor to analyze threshold voltage, drain current, and switching behavior.
Hardware Requirements:
1. Regulated DC Power Supply (0–30V)
2. Function Generator
3. Digital Multimeter
4. Cathode Ray Oscilloscope (CRO) or DSO
5. Breadboards and Connecting Wires
6. Resistors, Capacitors, Diodes (1N4007, Zener Diodes)
7. BJTs (e.g., BC107, 2N2222), JFETs (e.g., J201), MOSFETs (e.g., IRF540N)
8. Trainer Kits (optional but preferred for ease)

Software Requirements (Any one of the listed tools or equivalent):
1. LTSpice (Free from Analog Devices)
2. NI Multisim (Academic License or Student Version)
3. Proteus Design Suite (Simulation and PCB Design)
4. TINA-TI (Free from Texas Instruments)
5. PSPICE for TI or OrCAD Lite
6. Windows PC or Laptop with minimum 4GB RAM and i3 processor or better

DIGITAL LOGIC DESIGN LAB

B.Tech. II Year I Sem. L T P C

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	TOTAL
A7EC12	PCC	3	0	0	3	40	60	100
Contact Classes:12	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

Course Overview

This laboratory course provides hands-on experience with the design, analysis, and simulation of digital circuits. Students begin by constructing and testing basic digital components using logic gate ICs, covering Boolean minimization, arithmetic circuits, code converters, and combinational building blocks. The second part focuses on implementing equivalent and advanced designs using Verilog HDL, exploring various modeling styles—dataflow, behavioral, and structural—along with simulation tools. The course emphasizes both foundational logic principles and modern digital system development practices.

Course Outcomes

(COs): After completing this course, students will be able to:

CO1: Analyze and simplify Boolean expressions and implement them using logic gates and ICs.

CO2: Design and realize combinational and sequential logic circuits using logic gate hardware.

CO3: Model digital systems in Verilog HDL using dataflow, behavioral, and structural styles.

CO4: Simulate and verify digital designs using industry-standard EDA tools and testbenches.

CO5: Build modular and hierarchical designs such as counters, FSMs, and shift registers.

Course Articulation Matrix:

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	2	2	2	-	-	-	-	-	1
CO2	3	3	3	2	2	-	-	-	-	-	1
C03	3	3	3	2	3	-	-	-	-	-	2
C04	2	2	2	3	3	-	-	-	-	-	2
C05	3	3	3	2	3	-	-	-	-	-	2

List of Experiments:

A. Realization in Hardware Laboratory (Using Logic ICs)

These are fundamental hands-on experiments conducted using logic ICs such as AND, OR, NOT, NAND, NOR, XOR gates, flip-flops, multiplexers, and decoders.

1. Realize and minimize Boolean functions using basic gates and universal gates (NAND/NOR) in SOP/POS form.
2. Design and implement Half Adder, Full Adder, Half Subtractor, and Full Subtractor using logic gates.
3. Construct and analyze basic logic gates (AND, OR, NOT, XOR, XNOR) using only NAND and NOR gates.
4. Design and implement parity bit generators (even and odd) and a 4-input majority logic circuit.
5. Design and implement code converters such as Binary to Gray, Gray to Binary, and BCD to Excess-3 using gates.
6. Design and implement simple combinational circuits: 2-to-1 multiplexer, 1-bit comparator, and 7-segment decoder logic.

B. Verilog HDL-Based Digital Design Experiments (Simulation-Based)

These experiments are implemented using Verilog HDL with different modeling styles (dataflow, behavioral, structural) and simulated using tools like Vivado, ModelSim, or Xilinx ISE.

1. Design and simulate a 2-bit comparator using dataflow modeling; extend it to 4-bit using structural modeling.
2. Implement a 2:1 multiplexer using dataflow modeling and design an 8:1 multiplexer using structural modeling.
3. Design a 2-to-4 decoder using dataflow modeling and realize a 3-to-8 decoder using structural modeling.
4. Implement a given Boolean function using a decoder-based approach in behavioural modeling.
5. Design and simulate a universal n-bit shift register (left, right, hold, parallel load) using behavioural modeling.
6. Design a synchronous MOD-n counter using behavioural modeling with D or JK flip-flops.
7. Design and simulate an asynchronous (ripple) counter for a custom sequence using structural modeling.
8. Implement a sequence detector for a given binary pattern using FSM (Moore/Mealy) in behavioural modeling.

Required Hardware (for Hardware Lab Experiments)

Component Description

Digital Trainer Kit Breadboard with power supply and clock generator

Logic ICs 7400 (NAND), 7402 (NOR), 7408 (AND), 7432 (OR), 7486 (XOR), 7404 (NOT), etc.

Flip-Flop ICs 7474 (D Flip-Flop), 7476 (JK Flip-Flop)

MUX/Decoder ICs 74153, 74138, 74139 LEDs, switches, connecting wires For I/O interface and testing

Required Software Tools (for Verilog HDL Experiments) (Any one of the tool below)

Software Purpose Xilinx Vivado HDL simulation and synthesis (preferred tool)

ModelSim Verilog simulation and waveform analysis

Xilinx ISE Legacy support for simulation and FPGA design

LINUX AND SHELL SCRIPTING

I B. Tech II Sem(R25)

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	TOTAL
A7EC13	ESC	0	0	2	1	40	60	100
Contact Classes:12	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

Prerequisites: Introduction to Basic Electrical Engineering

Course Objectives:

1. To familiarize students with the Linux operating system environment and file system structure.
2. To develop proficiency in using essential Linux commands for file, user, and process management.
3. To understand and apply file permissions, ownership, and security concepts.
4. To learn the basics of shell programming, including variables, decision-making, and looping constructs.

Course Outcomes:

1. Students will be able to navigate the Linux environment, identify system information, and manage files/directories.
2. Students will be able to manage users, groups, processes, and system resources effectively.
3. Students will be able to design and execute shell scripts using control structures, loops, and variables.

CO-PO Matrix Table:

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

List of experiments/demonstrations:

PART- A (Compulsory)

1. List of Operating Systems and its use cases
2. Study of Linux environment, file system structure, and basic commands
3. File and directory operations: create, delete, move, copy, and view contents
4. File permissions and ownership management
5. To create and edit text file using Vi/Vim editor and practice basic editing operations.
6. User and group management – create users, assign passwords, switch users
7. Process management using ps, top, kill, bg, and fg.

8. Searching and filtering operations using grep, find, locate, and pipes.
9. Archiving and compression using tar, gzip, and zip.
10. Write and execute a simple shell script (Hello World).
11. Shell scripting with variables and user input.
12. Implement decision making and looping in shell scripts
13. Automating tasks using shell scripts with Cron scheduler.
14. File Handling Operations in Linux Operating System

TEXT BOOKS:

1. Richard Petersen, *Linux: The Complete Reference*, McGraw-Hill, 6th Edition, 2007.
2. Christopher Negus, *Linux Bible*, Wiley Publishing, 9th Edition, 2015.
3. William E. Shotts Jr., *The Linux Command Line: A Complete Introduction*, No Starch Press, 2nd Edition, 2019.
4. Neil Matthew and Richard Stones, *Beginning Linux Programming*, Wrox Press, 4th Edition, 2008.
5. Brian Ward, *How Linux Works: What Every Super user Should Know*, No Starch Press, 3rd Edition, 2021.
6. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, and Dan Mackin, *UNIX and Linux System Administration Handbook*, Pearson, 5th Edition, 2018.

ENVIRONMENTAL SCIENCE								
B.Tech. II Year I Sem. L T P C								
Course Code	Category	Hours/ Week			Credits	Maximum Marks		
A7BS12	BSC	L	T	P	C	CIE	SEE	TOTAL
		3	0	0	3	40	60	100
Contact Classes:12	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

Course Objectives:

1. Understand the components, structure, and functions of ecosystems and their relevance to human society.
2. Comprehend classification, sustainable management, and challenges of natural resources including water, minerals, land, forests, and energy.
3. Grasp the significance, value, and conservation approaches for biodiversity, including threats
and legislative frameworks.
4. Analyze types, sources, and impacts of environmental pollution, and learn technological and
policy measures for pollution prevention and control.
5. Develop awareness about global environmental challenges, international agreements, and the role of policy, law, and Environmental Impact Assessment (EIA) in sustainable development.

Course Outcomes:

1. Understand the structure, function, and significance of ecosystems, including energy flow, biogeochemical cycles, and biodiversity conservation through field experiences.
2. Analyze the classification, utilization, and sustainable management of natural resources, along with alternative energy options.
3. Evaluate biodiversity at genetic, species, and ecosystem levels, its values, threats, and conservation methods under national and international frameworks.
4. Identify types, sources, and impacts of environmental pollution, and apply suitable control technologies while assessing global environmental challenges and protocols.
5. Interpret environmental policies, legislation, and the EIA process to propose management plans addressing contemporary environmental and sustainability issues.

UNIT - I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Bio magnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II

Natural Resources: Classification of Resources: Living and Non-Living resources, water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, Land resources: Forest resources, Energy resources: growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT - III

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In- Situ and Ex-situ conservation. National Biodiversity act.

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Sources and types of pollution, drinking water quality standards. Soil Pollution: Sources and types, Impacts of modern agriculture, degradation of soil.
Noise Pollution: Sources and Health hazards, standards, Solid waste: Municipal Solid Waste management, composition and characteristics of e-Waste and its management. Pollution control technologies: Wastewater Treatment methods: Primary, secondary and Tertiary. Overview of air pollution control technologies, Concepts of bioremediation. Global Environmental Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan(EMP). Contemporary Environmental Issues Climate change; Sustainable development goals (SDGs); Global environmental challenges; Environmental policies and international agreements.

TEXT BOOKS:

1. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.
2. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
3. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications

NUMERICAL METHODS AND COMPLEX VARIABLES								
B.Tech. II Year I Sem								
Course Code	Category	Hours/ Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	TOTAL
A7BS06	BSC	3	0	0	3	40	60	100
Contact Classes:50	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

Pre-requisites: Mathematics courses of first year of study.

Course Objectives: To learn

1. Expressing periodic function by Fourier series and a non-periodic function by Fourier transforms
2. Various numerical methods to find roots of polynomial and transcendental equations.
3. Concept of finite differences and to estimate the value for the given data using interpolation.
4. Evaluation of integrals using numerical techniques
5. Solving ordinary differential equations of first order using numerical techniques.
6. Differentiation and integration of complex valued functions.
7. Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
8. Expansion of complex functions using Taylor's and Laurent's series.

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

1. Express any periodic function in terms of sine and cosine.
2. Find the root of a given polynomial and transcendental equations.
3. Estimate the value for the given data using interpolation
4. Find the numerical solutions for a given first order ODE's
5. Analyze the complex function with reference to their analyticity, integration using Cauchy's integral and residue theorems.
6. Taylor's and Laurent's series expansions in complex function.

UNIT-I: Fourier Series & Fourier Transforms 8 L

Fourier series – Dirichlet's Conditions – Half-range Fourier series – Fourier Transforms: Fourier Integral Theorem (Only statements), Fourier Sine and Cosine transforms (Elementary illustrations)

UNIT-II: Numerical Methods-I 10 L

Solution of polynomial and transcendental equations: Bisection method – Iteration Method – Newton- Raphson method and Regula-Falsi method. Finite differences: forward differences – backward differences – central differences – symbolic relations – Interpolation using Newton's forward and backward difference formulae – Lagrange's method of interpolation.

UNIT-III: Numerical Methods-II 10 L
Numerical integration: Trapezoidal rule - Simpson's 1/3rd and 3/8th rules. Ordinary differential equations: Taylor's series – Euler's method – Runge-Kutta method of fourth order for first order ODE.
UNIT-IV: Complex Differentiation 10 L
Differentiation of Complex functions – Analyticity – Cauchy-Riemann equations (without proof) – Harmonic Functions – Finding harmonic conjugate – Milne-Thomson method – Elementary analytic functions (exponential, trigonometric, logarithm) and their properties.
UNIT-V: Complex Integration 10 L
Line integral – Cauchy's theorem – Cauchy's Integral formula – Zeros of analytic functions – Singularities – Taylor's series – Laurent's series. Residues – Cauchy Residue theorem (All theorems without Proof).
TEXT BOOKS:
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
R25 B.Tech. ECE Syllabus JNTUH Hyderabad
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
REFERENCE BOOKS
1. Murray R. Spiegel, Ph.D., Seymour Lipschutz, Ph.D., John J. Schiller, Ph.D., Dennis
Spellman, Ph.D., Complex Variables (Schaum's outline).
2. M. K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering
Computations, New Age International publishers.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9thEdition, John Wiley &Sons, 2006.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, Mc-Graw Hill, 2004.

MARRI LAXMAN REDDY GROUP OF INSTITUTIONS MLR INSTITUTE OF TECHNOLOGY (UGC AUTONOMOUS) Affiliated to JNTUH,Approved by AICTE Laxman Reddy Avenue, Dundigal, Hyderabad-500 043, Telangana, India NBA NATIONAL BOARD OF ACCREDITATION NAAC

ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES

B.Tech. II Year I Sem

Course Code	Category	Hours/ Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	TOTAL
A7EC14	PCC	3	0	0	3	40	60	100
Contact Classes:50	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

Pre-requisite: Mathematics

Course Objectives:

1. To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magneto static Fields and apply them to solve physics and engineering problems.
2. To distinguish between static and time-varying fields and understand the significance and utility of Maxwell's Equations and Boundary Conditions, and gain ability to provide solutions to communication engineering problems.
3. To analyze the characteristics of Uniform Plane Waves (UPW), determine their propagation parameters and estimate the same for dielectric and dissipative media.
4. To analyze the propagation of waves in transmission line and able to solve transmission line problem using Smith Chart.

Course Outcomes:

Upon completing this course, the student will be able to

1. Acquire knowledge of Basic Laws, Concepts and solve problems related to Electrostatic Fields and Magnetostatics Fields.
2. Differentiate the static and time-varying EM fields and apply Maxwell's Equations at different Boundaries.
3. Able to classify conductors and dielectric materials and analyze the Wave Propagations in those mediums.
4. To solve transmission line problems numerically and using smith charts.

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	2	1	-	1	-	-	-	1	-
CO2	3	3	2	1	-	1	-	-	-	1	-
C03	3	3	2	1	-	1	-	-	-	1	-
C04	3	3	2	1	-	1	-	-	-	1	-

UNIT I – Electrostatics

Review of Coordinate Systems & Vector Calculus, Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and its applications, Electric Potential, Relation between E and V, Maxwell's Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitors–Parallel Plate, Coaxial, Spherical.

UNIT II - Magnetostatics

Biot-Savart's Law, Ampere's Circuit Law and its applications, Magnetic Flux Density, Maxwell's equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law.

UNIT III - Maxwell's Equations (Time Varying Fields)

Faraday's Law, Transformer and Motional EMF, Inconsistency in Ampere's Law and Displacement Current Density, Maxwell's Equations in Differential, Integral and Phasor form. Electric and magnetic Boundary Conditions (Dielectric – Dielectric, Conductor– Dielectric, Conductor– Free Space interfaces).

UNIT IV - EM Wave Characteristics

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves– Definitions, Relation between E&H, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Skin Depth, Surface Impedance, Wave Polarization. Poynting Vector and Poynting Theorem. Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection,

UNIT V - Transmission Lines

Types, Parameters, Equivalent Circuit, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless Lines, Types of Distortions, condition for Distortion less transmission lines, Minimum Attenuation, Loading – Types of Loading, Input Impedance, SC and OC Lines, Reflection Coefficient, VSWR, Impedance Transformations - $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines, Smith Chart- Configuration and Applications, Single Stub Matching.

TEXT BOOKS:

1. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck,8thEd., McGrawHill,2014
2. Principles of Electromagnetics –Matthew N.O. Sadiku and S.V. Kulkarni, 6thEd., Oxford University Press, Asian Edition, 2015.

REFERENCES:

1. Electromagnetic Waves and Radiating Systems–E.C. Jordan and K.G. Balmain,2ndEd., PHI,2000.
2. Engineering Electromagnetics – NathanIda, 2ndEd., Springer (India) Pvt. Ltd., New Delhi,2005.
3. Electromagnetic Field Theory Fundamentals –Bhag Singh Guru and Husey in R. Hiziroglu, Cambridge University Press, 2nd Ed., 2006.

ANALOG AND DIGITAL COMMUNICATIONS

B.Tech. II Year I Sem

Course Code	Category	Hours/ Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	TOTAL
A7EC15	PCC	3	0	0	3	40	60	100
Contact Classes:50	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

Pre-requisite: Signals and Systems

Course Objectives:

1. To develop ability to analyze system requirements of analog and digital communication systems.
2. To understand the generation, detection of various analog and digital modulation techniques.
3. To acquire theoretical knowledge of each block in AM, FM transmitters and receivers.
4. To understand the concepts of baseband transmissions.

Course Outcomes:

Upon completing this course, the student will be able to:

1. Design and analyze various Analog and digital Modulation and Demodulation techniques.
2. Understand the effect of noise present in continuous wave Modulation techniques.
3. Understand the concept of Super heterodyne Receiver and Pulse Modulation Techniques
4. Analyze and design the various coding techniques and Base band Transmission.

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	1	-	3	2	-	-	-	-
CO2	3	3	3	1	-	2	2	-	-	-	-
C03	3	3	3	1	-	2	2	-	-	-	-
C04	3	3	3	1	-	3	2	-	-	-	-

UNIT - I

Amplitude Modulation Need for modulation, Amplitude Modulation: Time and frequency domain description, Generation – Switching modulator, Detection - Envelope detector, DSB-SC Modulation: Generation – Balanced Modulator, Detection- Synchronous detector, COSTAS Loop, SSB Modulation: Time and frequency domain description, Generation – Phase discrimination Method and Demodulation – coherent detection, Vestigial side band modulation and demodulation. Angle Modulation Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis, Carson's

Rule, Generation of FM Waves- Armstrong Method, Detection of FM Waves - Phase locked loop, Comparison of FM and AM.

UNIT - II

Transmitters & Receivers Classification of Transmitters, AM Transmitters, FM Transmitters, AM Receiver - Super heterodyne receiver, FM Receivers, Stereo FM multiplex reception, Comparison of AM and FM Receiver. Noise analysis in AM, DSB, SSB and FM Modulation System, Threshold effect in Angle Modulation System, Pre- emphasis, and de-emphasis
Pulse Modulation Types of Pulse modulation-PAM, PWM and PPM, Comparison of FDM and TDM.

UNIT – III

Detection and Estimation: Model of Digital Communication Systems, Geometric Interpretation of Signals, Gram-Schmidt Orthogonalization, Response of Bank of correlators to Noisy Input, Detection of Known Signals in Noise, Probability of error, Optimum Receivers Using Coherent Detection: Matched filter Receiver and its Properties, Correlation receiver, Detection of signals with unknown Phase in Noise Base Band Shaping for Data Transmission: Requirements of a line encoding format, various line encoding formats- Unipolar, Polar, Bipolar, Discrete PAM signals, Inter symbol interference, Nyquist's criterion, Correlation coding: Duobinary signaling, Modified Duobinary technique, generalized form of correlation coding, Eye pattern.

UNIT - IV

Digital Modulation Techniques:
PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, DM and Adaptive DM, Noise in PCM and DM.
Digital Modulation formats, Coherent binary modulation techniques (BPSK, BFSK), Coherent quadrature modulation techniques (QPSK), Non-Coherent binary modulation techniques (BFSK, DPSK), QAM, M-ary modulation techniques (PSK, FSK, QAM), Comparison of M-ary digital modulation techniques, power spectra, bandwidth efficiency, constellation diagrams.

UNIT - V

Information theory: Entropy, Information rate, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade-off between bandwidth and SNR.
Source coding - Huffman coding, Shannon Fano coding, Channel coding - Linear block codes and cyclic codes.

TEXT BOOKS:

1. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5th Edition, PHI, 2009.
2. Digital and Analog Communication System – K. Sam Shanmugam, Wiley, 2019.
3. Principles of Communication Systems - Herbert Taub, Donald L Schiling, Goutam Saha, 3rd
Edition, McGraw-Hill, 2008.

REFERENCES:

1. Electronic Communications – Dennis Roddy and John Coolean, 4th Edition, PEA, 2004
2. Electronics & Communication System – George Kennedy and Bernard Davis, TMH, 2004
3. Communication System - Simon Haykin and Michael Moher, Wiley, 5th edition, 2022

ELECTRONIC CIRCUIT ANALYSIS

B.Tech. II Year I Sem

Course Code	Category	Hours/ Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	TOTAL
A7EC16	PCC	3	0	0	3	40	60	100
Contact Classes:50	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

Course Overview:

The Electronic Circuit Analysis course provides foundational and advanced knowledge in the design and analysis of analog electronic circuits. This includes the study of multistage amplifiers, feedback amplifiers, oscillators, power amplifiers, and multivibrators. Emphasis is placed on frequency response, feedback theory, transistor behavior at high frequencies, and waveform generation techniques. The course equips students with the necessary analytical and practical skills required in analog circuit design and communication systems.

Course Outcomes (COs): By the end of this course, students will be able to:

CO1: Analyze and classify multistage amplifier configurations and determine the impact of coupling schemes on amplifier performance and frequency response.

CO2: Apply the hybrid-π transistor model to evaluate high-frequency behavior of common-emitter amplifiers and calculate gain-bandwidth product.

CO3: Examine feedback amplifier types and assess the influence of negative feedback on gain stability, bandwidth, and distortion.

CO4: Design and analyze LC, RC, and crystal oscillators based on the Barkhausen criterion to generate sinusoidal waveforms.

CO5: Design power amplifiers and multivibrator circuits, and evaluate their performance in terms of efficiency, distortion, and waveform generation.

Course Articulation Matrix:

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	2	2	1	1	0	0	0	0	0
CO2	3	3	3	2	2	0	0	0	0	0	1
C03	3	3	3	2	2	1	0	0	0	0	1
C04	3	3	3	2	2	0	0	0	0	0	1
C05	3	3	3	2	2	1	0	0	0	0	1

UNIT - I:

Multistage Amplifiers: Classification of Amplifiers, Distortion in Amplifiers, Coupling schemes: RC, Transformer, Direct coupling, Frequency response of multistage amplifiers, Transistor configuration choice in cascade amplifiers, Cascade and Cascode amplifiers, Darlington pair amplifier. High-Frequency Transistor Model: Hybrid-π model, Hybrid-π parameters: Conductances and capacitances, CE short-circuit current gain, Gain with resistive load and gain-bandwidth product

UNIT - II:

Feedback Amplifiers: Concept and need for feedback in amplifiers, Types and classification of feedback amplifiers, Characteristics of negative feedback: Gain stability, bandwidth, noise, distortion,Voltage series, Voltage shunt, Current series, Current shunt configurations.

UNIT - III:

Oscillators: Principle of positive feedback, Barkhausen Criterion for oscillations, LC Oscillators: Generalized analysis, Hartley, Colpitts, RC Oscillators: RC phase shift, Wien bridge, Crystal oscillator: Working and advantages

UNIT - IV:

Power Amplifiers: Classification: Class A, B, AB, C, Series-fed Class A amplifier, Transformer coupled Class A amplifier, Class B amplifier: Push-pull, Complementary symmetry, Efficiency calculations and Crossover distortion.

UNIT - V:

Multivibrators: Analysis and design of Bistable, Monostable and Astable multivibrators and Schmitt Trigger using transistors. Time Base Generators: General features of a time base signal, methods of generating time base

LINEAR AND DIGITAL INTEGRATED CIRCUIT APPLICATIONS

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A7EC17	PCC	3	0	0	3	40	60	100

Course Objectives: The main objectives of the course are:
1. To introduce the basic building blocks of linear integrated circuits.
2. To introduce the theory and applications of analog multipliers and PLL.
3. To introduce the concepts of waveform generation and introduce some special function ICs.
4. To understand and implement the working of basic digital circuits.

Course Outcomes: Upon completing this course, the student will be able to
1. A thorough understanding of operational amplifiers with linear integrated circuits.
2. Attain the knowledge of functional diagrams and design applications of IC555andIC565.
3. Acquire the knowledge and design the Data converters.
4. Understanding of the different families of digital integrated circuits and their characteristics.

UNIT-I	Operational Amplifier	Classes: 09

Ideal and Practical Op-Amp Characteristics, Features of 741 Op- Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT-II	Op-Amp, IC-555 & IC565 Applications	Classes: 09

Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, principle and Applications.

UNIT-III	Data Converters	Classes: 09

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2Rladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT-IV	Combinational Logic ICs	Classes: 09

Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.		
UNIT-V	**Sequential Logic IC's and Memories**	**Classes: 09**
Familiarity with commonly available 74XX & CMOS40XX Series ICs– All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers. Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.		
Text Books: 1. Op-Amps & Linear ICs– Ramakanth A. Gayakwad, PHI, 2003. 2. Digital Fundamentals –Floydand Jain, Pearson Education,8th Ed., 2005.		
Reference Books:		
1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2ndEd., 2003. 2. Digital Design Principles and Practices–John. F. Wakerly, Pearson 3rd Ed., 2009. 3. Linear Integrated Circuits and Applications – Salivahana, TMH, 2008. 4. OperationalAmplifierswithLinearIntegratedCircuits,4th Ed., William D. Stanley, Pearson Education India, 2009.		
Web References:		
1. https://www.electronics-tutorials.ws/opamp/opamp_1.htm 2. https://circuitdigest.com/article/555-timer-ic		
E-Text Books:		
1. http://dea.unsj.edu.ar/sredes/Biblioauxi/130107134-106147696-S-Franco-Design-With-Operational-Amplifiers-and-Analog-Integrated-Circuits-1-pdf.pdf2. 2. https://www.u-cursos.cl/usuario/9553d43f5ccbf1cca06cc02562b4005e/mi_blog/r/%5BgrayMeyer%5D_Analysis_and_Design_of_Analog_Integrated_Circuits_5th_cropped.pdf		
MOOC Course		
1.http://nptel.ac.in/courses/117107094/30 2.http://nptel.ac.in/courses/117108107/Lecture%2035.pdf		

ANALOG AND DIGITAL COMMUNICATIONS LAB

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A7EC18	PCC	3	-	-	3	40	60	100
Contact Classes:50	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

COURSE OBJECTIVES:

The course should enable the students to

1. Demonstrate the characteristics and applications of Op-Amps
2. Verify the functionality of specific ICs like 555 timer, and voltage regulators.
3. Verify the various digital functions using Verilog HDL.
4. Verify the combinational and sequential functions using Verilog HDL.

COURSE OUTCOMES:

Upon successful completion of the course, the student is able to

CO1: Will be able to design and implement various Analog modulation and demodulation Techniques
and observe the time and frequency domain characteristics of these modulated Signals
CO2: Will be able to design and implement various Pulse modulation and demodulation Techniques
and observe the time and frequency domain characteristics of these modulated Signals
CO3: Will be able to understand the concept of aliasing and different types of Sampling with various
Sampling rates and duty Cycles by implementing practically
CO4: Will be able to design and implement various Digital modulation and demodulation Techniques
and observe the wave forms of these modulated Signals practically

LIST OF EXPERIMENTS

• Minimum 12 experiments should be conducted.

All these experiments are to be simulated first either using MATLAB, Commsim or any other simulation package and then to be realized in hardware.
List of Experiments:
1. Generate Amplitude modulated Signal and perform demodulation for different modulation indices. Plot the corresponding waveforms and their spectrum. Compare the modulation index theoretically and practically. Plot the effect of modulating Signal frequency and Amplitude on the modulation index.
2. Generate Frequency modulated Signal and perform demodulation for different modulation indices. Plot the corresponding waveforms and their spectrum. Compare the modulation index theoretically and practically. Plot the effect of modulating Signal frequency and Amplitude on the modulation index.
3. Generate modulated and demodulate DSB-SC Signal for different modulation indices and plot

the corresponding waveforms and their spectrum. Compare the modulation index theoretically and practically
4. Generate and demodulate SSB-SC modulated Signal (Phase Shift Method) for different modulation indices and plot the corresponding waveforms and their spectrum. Also calculate theoretically and practically the modulation index in each case
5. Demonstrate the Frequency Division Multiplexing & De multiplexing practically by transmitting at least 4 different signals simultaneously with respect to time and recovering without distortion.
6. Verify Sampling theorem for different sampling rates, Sampling types and Duty Cycles and Plot the sampled and reconstructed Signals. Write the conclusions, based on practical observations
7. Design and implement a Pulse Amplitude Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
8. Design and implement a Pulse Width Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
9. Design and implement a Pulse Position Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
10. Generate PCM Modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations
11. Generate Delta Modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
12. Generate FSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
13. Generate practically Binary PSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
14. Generate practically DPSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
15. Generate practically QPSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
16. Plot Signal Constellation for BPSK, BFSK and QPSK
17. Analyze the performance of BPSK, BFSK and QPSK under noisy environment through constellation diagram
18. Demonstrate ISI through eye diagram
19. Simulate raised cosine signal and duo binary signals
20. Encode data using Shannon Fano /Huffman Coding through Hardware / Simulator
21. Analyze the performance of a Matched filter.

ELECTRONIC CIRCUIT ANALYSIS LAB

B.Tech. II Year II Sem

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A7EC19	PCC	3	-	-	3	40	60	100
Contact Classes: 12	Tutorial Classes: 0	Practical Classes: 24			Total Classes: 24			

Course Overview:

The Electronic Circuit Analysis Laboratory is designed to provide hands-on experience in designing, building, and analyzing analog electronic circuits. It focuses on the practical implementation of amplifiers, oscillators, power amplifiers, multivibrators, and waveform generators using discrete components and simulation tools. The lab strengthens understanding of frequency response, gain, feedback, waveform shaping, and time base generation.

Course Outcomes (COs): Upon successful completion of this lab, students will be able to:

CO1: Design and analyze multistage and power amplifiers and evaluate their frequency response and efficiency.

CO2: Implement and examine feedback and oscillator circuits and validate theoretical conditions for sustained oscillations.

CO3: Develop and interpret waveform generation circuits such as multivibrators and time base generators.

CO4: Perform simulations to validate analog circuit performance using industry-standard software tools.

CO5: Correlate practical results with theoretical predictions and identify deviations due to real-world constraints.

Course Articulation Matrix:

Course	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11
CO1	3	3	3	2	2	1	-	-	-	-	-
CO2	3	3	3	2	2	1	-	-	-	-	-
C03	3	3	3	2	1	-	-	-	-	-	-
C04	2	2	3	3	3	-	-	-	-	-	1
C05	3	3	2	3	2	1	-	-	-	-	1

List of Experiments:

A. Hardware Experiments (7):

Perform practical design, implementation, and waveform analysis of amplifiers, oscillators, power stages, and multivibrators to validate theoretical concepts and observe real-world circuit behavior.

1. Design and analyze a two-stage RC coupled amplifier to demonstrate gain enhancement and study coupling capacitance effects.
2. Design Hartley and Colpitts oscillators for a specified frequency and observe their output waveforms.
3. Design an RC phase shift oscillator and derive the practical gain condition for oscillations at a given frequency.

4. Design a transformer-coupled class A power amplifier, observe input/output waveforms, and calculate efficiency.
5. Design a class B power amplifier, analyze input/output waveforms, and evaluate harmonic distortion.
6. Design a bistable multivibrator, analyze commutating capacitor effects, and record transistor waveforms.
7. Design an astable multivibrator and observe transistor base and collector waveforms.

B. Software Simulations (7):
Use circuit simulation software to design, analyze, and verify the performance of feedback amplifiers, waveform generators, and power amplifier circuits through virtual experimentation and frequency response evaluation.
1. Simulate four feedback amplifier topologies and compare their frequency responses with and without feedback.
2. Simulate a monostable multivibrator and analyze its input/output waveforms.
3. Simulate a Schmitt trigger for gain values greater than and less than one and analyze response behavior.
4. Simulate a bootstrap time base generator using BJT and observe the output sweep waveform.
5. Simulate a Miller sweep circuit using BJT and observe the time base output waveform.
6. Simulate a complementary symmetry push-pull amplifier and verify elimination of crossover distortion.
7. Simulate a single tuned amplifier and determine the quality factor (Q) of its tuned circuit.
Software Requirements:
Simulation Tools: LTspice / Multisim / PSpice / Proteus / NI Multisim Live or equivalent
Operating System: Windows 10/11 or Linux (Ubuntu preferred)

Hardware Requirements:
1. Dual Power Supply (±15V, 0–30V)
2. Function Generator (up to 1 MHz)
3. CRO / DSO (Dual Channel, 20 MHz or more)
4. Digital Multimeters
5. Breadboards and Connecting Wires
6. BJTs: BC107, BC547, BC557, 2N2222, etc.
7. Resistors, Capacitors (Wide range of values)
8. Transformers (for power amplifiers)
9. Inductors, Crystals (1 MHz, 4 MHz, etc.)
10. Heat sinks, transistors for power stages (e.g., TIP41, TIP42 etc.)

Linear & Digital IC APPLICATIONS LAB

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CI	SEE	Total
A7EC20	PCC	-	-	2	1	40	60	100

COURSE OBJECTIVES:

The course should enable the students to

1. Demonstrate the characteristics and applications of Op-Amps
2. Verify the functionality of specific ICs like 555 timer, and voltage regulators.
3. Verify the various digital functions using Verilog HDL.
4. Verify the combinational and sequential functions using Verilog HDL.

COURSE OUTCOMES:

Upon successful completion of the course, the student is able to

CO1: Design and implementation of various analog circuits using 741 ICs.
CO2: Design and implementation of various Multivibrators using 555 timer
CO3: Design and implement various circuits using digital ICs
CO4: Design and implement ADC, DAC and voltage regulators.

LIST OF EXPERIMENTS

The following experiments from 1 to 8 are using ICs and the remaining experiments are using EDA simulation tools

Note:

- Minimum 12experiments should be conducted.
- Verify the functionality of the IC in the given application.

List of Experiments:

1. Design an Inverting and Non-inverting Amplifier using Op Amp and calculate gain.
2. Design Adder and Subtractor using Op Amp and verify addition and subtraction process.
3. Design a Comparator using Op-Amp and draw the comparison results of A=B, A<B, A>B.
4. Design a Integrator and Differentiator Circuits using IC741 and derive the required condition practically.
5. Design a Active LPF, HPF cutoff frequency of 2 KHz and find the roll off of it.
6. Design a Circuit using IC741 to generate sine / square / triangular wave with period of 1 KHz and draw the output waveform.
7. Construct Mono-stable Multivibrator using IC555 and draw its output waveform.
8. Construct Astable Multivibrator using IC 555 and draw its output waveform and also find its duty cycle.
9. Design a Schmitt Trigger Circuit and find its LTP and UTP.
10. Design Frequency modulator and demodulator circuit and draw the respective waveforms.
11. Design Voltage Regulator using IC723, IC 7805 / 7809 / 7912 and find its load regulation factor.
12. Design R-2R ladder DAC and find its resolution and write a truth table with respective

voltages.
13. Design Parallel comparator type / counter type / successive approximation ADC and find its efficiency.
14. Design a Gray code converter and verify its truth table.
15. Design an even priority encoder using IC74xx and verify its truth table.
16. Design a 8x1multiplexer using digital ICs.
17. Design a 4-bit Adder / Subtractor using digital ICs and Add / Sub the following bits. (i) 1010 (ii) 0101 (iii) 10110100 0010 1001.
18. Design a Decade counter and verify its truth table and draw respective waveforms.
19. Design a Up/downcounterusingIC74163anddrawread/write waveforms.
20. Design a Universal shift register using IC74194 / 195and verify its shifting operation.
21. Design a 16x4 RAM using 74189 and draw its read /write operation.
22. Design a 8x3 encoder / 3x8 decoder and verify its truth table.

Reference Books:

1. D. Roy Choudhury, Shail B. Jain (2012), Linear Integrated Circuit, 4th edition, New Age International Pvt.Ltd., NewDelhi, India.
2. Thomas L. Floyd (2013), Digital Fundamentals – A Systems Approach –Pearson

COMPUTATIONAL MATHEMATICS LAB							
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**	
A7BS07	**BSC**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	**-**	**-**	**3**	**40**	**60**	**100**
Contact Classes:12	**Tutorial Classes: 0**	**Practical Classes: 24**				**Total Classes: 24**		

Pre-requisites: Matrices, Iterative methods and ordinary differential equations

Course Objectives: To learn

1. Solve problems of Eigen values and Eigen Vectors using Python/MATLAB.
2. Solution of Algebraic and Transcendental Equations using Python/MATLAB
3. Solve problems of Linear system of equations
4. Solve problems of First-Order ODEs Higher order linear differential equations with constant coefficients

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

1. Develop the code to find the Eigen values and Eigen Vectors using Python/MATLAB.
2. Develop the code find solution of Algebraic and Transcendental Equations and Linear system of equations using Python/MATLAB
3. Write the code to solve problems of First-Order ODEs Higher order linear differential equations with constant coefficients

* Visualize all solutions Graphically through programmes

UNIT - I: Eigen values and Eigenvectors: 6P

Programs:
Finding real and complex Eigen values.
Finding Eigen vectors.

UNIT-II: Solution of Algebraic and Transcendental Equations 6P

Bisection method, Newton Raphson Method
Programs:

1. Root of a given equation using Bisection method.
3. Root of a given equation Newton Raphson Method.
4.

UNIT-III: Linear system of equations: 6P

Jacobi's iteration method and Gauss-Seidal iteration method
Programs:
1. Solution of given system of linear equations using Jacobi's method
2. Solution of given system of linear equations using Gauss-Seidal method

UNIT-IV: First-Order ODEs

8P Exact and non-exact equations, Applications: exponential growth/decay, Newton's law of cooling. Programs:

1. Solving exact and non-exact equations

Solving exponential growth/decay and Newton's law of cooling problems

UNIT-V: Higher order linear differential equations with constant coefficients 6P
Programs: 1. Solving homogeneous ODEs 2. Solving non-homogeneous ODEs
TEXT BOOKS:
1. MATLAB and its Applications in Engineering, Rajkumar Basal, Ashok Kumar Geo, Manoj Kumar Sharma, Pearson publication. 2. Kenneth A. Lambert, The fundamentals of Python: First Programs, 2011, Cengage Learnings. 3. Think Python First Edition, by Allen B. Downey, Orielly publishing. 4. Introduction to Python Programming, William Mitchell, Povel Solin, Martin Novak et al., NCLab Public Computing, 2012. 5. Introduction to Python Programming, ©Jacob Fredslund, 2007. **REFERENCE BOOKS:** 1. An Introduction to Python, John C. Lusth, The University of Alabama, 2011. 2. Introduction to Python, ©Dave Kuhlman, 2008.

ANALOG & DIGITAL IC APPLICATIONS LAB

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A7EC18	PCC	-	-	2	1	40	60	100
Contact Classes:12	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

COURSE OBJECTIVES:

The course should enable the students to

1. Demonstrate the characteristics and applications of Op-Amps
2. Verify the functionality of specific ICs like 555 timer, and voltage regulators.
3. Verify the various digital functions using Verilog HDL
4. Verify the combinational and sequential functions using Verilog HDL

COURSE OUTCOMES:

Upon successful completion of the course, the student is able to

1. Design various applications using op-amp
2. Design various applications with 555 timer IC
3. Deign various sequential and combinational circuits using Verilog HDL.

LIST OF EXPERIMENTS

The following experiments from 1 to 8 are using ICs and the remaining experiments are using EDA simulation tools

1. Basic applications of IC741 op-amp.
2. Integrator and differentiator using IC741 op-amp.
3. Adder, Subtractor, Comparator using IC 741 Op-Amp.
4. Active Low Pass & High Pass Butterworth filters (1st &2nd Order).
5. RC Phase Shift and Wien Bridge Oscillators using IC 741 Op-Amp
6. IC 555 timer in Astable and Monostable operation.
7. Schmitt trigger circuits using IC 741 op-amp & IC 555 timer.
8. Voltage regulator IC 723, three terminal voltage regulators- 7805, 7809, 7912.
9. Design and simulate all logic gates.
10. Implement a Verilog code for AOI logic
11. Design and check the truth tables of adders and subtractors.
12. Implementation of binary to gray and gray to binary code convertor using Verilog.
13. Design and simulate Multiplexer and De-multiplexer.
14. Design and simulate Encoder and Decoder.
15. Design and simulate 8*1 multiplexer using lower order multiplexers.

Reference Books:

1.D. Roy Choudhury, Shail B. Jain (2012), Linear Integrated Circuit, 4th edition, New Age International Pvt.Ltd., NewDelhi, India.
2.Thomas L. Floyd (2013), Digital Fundamentals – A Systems Approach –Pearson

SQL Lab Programs – 2nd Year ECE

SQL Lab Programs

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
A7EC21		3	-	-	3	40	60	100
Contact Classes:12	Tutorial Classes: 0	Practical Classes: 24				Total Classes: 24		

Unit 1: Basic SQL Commands

1.Create Student table and perform insert, update, delete.
2. Create Sensor table and modify structure.

Unit 2: SELECT Queries

3. Display ECE students.
4. Retrieve ACTIVE sensors.
5. Sort employees by salary.

Unit 3: Functions

6. Max, Min, Avg of marks.
7. Count ACTIVE sensors.

Unit 4: Joins

8. Students with departments.
9. Departments with no students.

Unit 5: Subqueries

10. Students above class average.

Unit 6: Grouping

11. Count students dept-wise.
12. Avg marks dept-wise > 70.

Unit 7: Constraints

13. Create Device table with constraints.
14.

Unit 8: Transactions

15. Commit and rollback demo.
16.

Unit 9: Mini-Programs

15. Top 3 highest marks.
16. 2nd highest salary.
17. Create view HighAchievers.