

ACADEMIC REGULATIONS (R25)

COURSE STRUCTURE AND I & II SYLLABUS



ELECTRONICS & COMMUNICATION ENGINEERING

For

B.Tech. - Regular Four Year Degree Course

(Applicable for the Students Admitted from AY 2025-26)

04



CMR ENGINEERING COLLEGE

UGC AUTONOMOUS

Approved by AICTE-New Delhi | Affiliated to JNTUH | Accredited by NAAC & NBA

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CMR ENGINEERING COLLEGE

Kandlakoya, Hyderabad

(Autonomous Institute, Approved by AICTE, Affiliated to JNTUH)



Established: 2010

EAMCET Code: CMRN

**Academic Regulations, Course Structure and Detailed
Syllabus under Autonomous Status**

BACHELOR OF TECHNOLOGY (B.TECH)

(CMREC–R-25 Regulations)

(Applicable for the batch admitted from 2025-2026)

PRELIMINARY DEFINITIONS AND NOMENCLATURES

AICTE: Means All India Council for Technical Education, New Delhi.

Autonomous Institute: Means an institute designated as Autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (Jawaharlal Nehru Technological University, Hyderabad) and State Government of Telangana.

Academic Autonomy: Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

Academic Council: The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

Academic Year: It is the period necessary to complete an actual course of study within a year. It comprises two main semesters i.e., (one odd + one even) and supplementary semester.

Branch: Means specialization in a program like B.Tech degree program in Electronics and communication Engineering, B.Tech degree program in Computer Science and Engineering, etc.

Board of Studies (BOS): BOS is an authority as defined in UGC regulations, constituted by Head of the Organization for each of the departments separately. They are responsible for curriculum design and updation in respect of all the programs offered by a department.

Backlog Course: A course is considered to be a backlog course, if the student has obtained a failure grade (F) in that course.

Basic Sciences: The courses offered in the areas of Mathematics, Physics, Chemistry etc., are considered to be foundational in nature.

Commission: Means University Grants Commission (UGC), New Delhi.

Choice Based Credit System: The credit based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

Compulsory course: Course required to be undertaken for the award of the degree as per the program.

Continuous Internal Examination: It is an examination conducted towards sessional assessment.

Core: The courses that are essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

Course: A course is a subject offered by a department for learning in a particular semester.

Course Outcomes: The essential skills that need to be acquired by every student through a course.

Credit: A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture/tutorial/lab hour per week.

Credit point: It is the product of grade point and number of credits for a course.

Cumulative Grade Point Average (CGPA): It is a measure of cumulative performance of a student over all the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

Curriculum: Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

Department: An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff, and other resources in the process of study for a degree.

Dropping from Semester: Student who does not want to register for any semester can apply in writing in prescribed format before the commencement of that semester.

Elective Course: A course that can be chosen from a set of courses. An elective can be Professional Elective and or Open Elective.

Evaluation: Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal assessment and semester end examinations.

Grade: It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

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

Honors: An Honors degree typically refers to a higher level of academic achievement at an undergraduate level.

Institute: Means CMR Engineering, Hyderabad unless indicated otherwise by the context.

Massive Open Online Courses (MOOC): MOOC courses inculcate the habit of self-learning. MOOC courses would be additional choices in all the elective group courses.

Minor: Minor are coherent sequences of courses which may be taken in addition to the courses required for the B.Tech degree.

Pre-requisite: A specific course or subject, the knowledge of which is required to complete before student register another course at the next grade level.

Professional Elective: It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

Program: Means, UG degree program: Bachelor of Technology (B.Tech) and PG degree program: Master of Technology (M.Tech).

Program Educational Objectives: The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.

Project work: It is a design or research based work to be taken up by a student during his/her final year to achieve a particular aim. It is a credit based course and is to be planned carefully by the student.

Re-Appearing: A student can reappear only in the semester end examination for theory component of a course, subject to the regulations contained herein.

Registration: Process of enrolling into a set of courses in a semester of a program.

Regulations: The regulations, common to all B.Tech Programs offered by Institute, are designated as CMREC Regulations R-25 and are binding on all the stakeholders.

Semester: It is a period of study consisting of 15 to 18 weeks of academic work equivalent to normally 90 working days. Odd semester commences usually in July and even semester in December of every year. .

Semester End Examinations: It is an examination conducted for all courses offered in a semester at the end of the semester.

Student Outcomes: The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioral.

University: Means Jawaharlal Nehru Technological University Hyderabad (JNTUH), Hyderabad, is an affiliating University.

Withdraw from a Course: Withdrawing from a course means that a student can drop from a course within the first two weeks of odd or even semester. However, he / she can choose a substitute course in place of it by exercising the option within 5 working days from the date of withdrawal.

FOREWORD

The autonomy is conferred to **CMR Engineering College (CMREC)**, Hyderabad by University Grants Commission (UGC), New Delhi based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies including JNT University Hyderabad (JNTUH), Hyderabad and AICTE, New Delhi. It reflects the confidence of the affiliating University in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf. Thus, an autonomous institution is given the freedom to have its own **examination system** and **monitoring mechanism**, independent of the affiliating University but under its observance.

CMREC is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, if not improving upon the standards and ethics for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies such as Academic Council and Board of Studies (BOS) are constituted with the guidance of the Governing Body of the institute and recommendations of the JNTUH to frame the regulations, course structure, and syllabi under autonomous status.

The autonomous regulations, course structure, and syllabi have been prepared after prolonged and detailed interaction with several expertise solicited from academics, industry and research, in accordance with the vision and mission of the institute in order to produce a quality engineering graduate to the society.

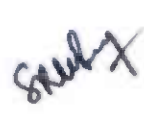
All the faculty, parents, and students are requested to go through all the rules and regulations carefully. Any clarifications needed are to be sought at appropriate time and from the principal of the institute, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stake holders is requested for the successful implementation of the autonomous system in the larger interests of the institute and brighter prospects of Engineering Graduates.


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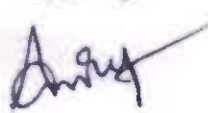










ACADEMIC REGULATIONS FOR B.TECH REGULAR STUDENTS
WITH EFFECT FROM THE ACADEMIC YEAR 2025-26 (R-25)

For pursuing four year under graduate Bachelor Degree Programme of study in Engineering (B.Tech) offered by CMR Engineering College under Autonomous status is here in referred to as CMREC (An Autonomous Institution)

All the rules specified here in approved by the Academic Council will be in force and applicable to students admitted from the Academic Year **2025-2026** onwards. Any reference to "Institute" or "College" in these rules and regulations shall stand for CMR Engineering College (An Autonomous Institution).

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, CMR Engineering College shall be the chairman Academic Council.

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

CMR Engineering College offers a 4-year (8 semesters) **Bachelor of Technology (B.Tech)** degree programme, under Choice Based Credit System (CBCS) with effect from the academic year **2025-26**.

2.0 Eligibility for Admission

- 2.1** Admissions to the under graduate (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 State Government (EAPCET) or the University or on basis of any other order of merit approved by the University, subject to reservations as prescribed by the government from time to time.
- 2.2** The medium of instructions for the entire under graduate 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 (eight semesters), 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 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 under graduate programme is off our academic years with each academic year divided into two semesters. There shall be a minimum of 15 weeks of instruction weeks, 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
8	Other Core Courses (OCC)	Industry Training/ Internship /Industry Oriented Mini-Project/ Skill Development Courses	Industry Training/ Internship/ Industry Oriented Mini-Project/Skill Development Courses

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 three weeks duration for the UG students entering the institution, right at the start is proposed. Normal classes start only after the induction programme is over. 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 or mentor' shall be assigned to a group of around 20 students, who will advise the students about the under graduate 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 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, alternate 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 alternate choice either for a new course (subject to offering of such a course), or for another existing course. Such alternate 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 for 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 subject teachers who could not take classes proportional to the number of weeks completed from the commencement of the semester.

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

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

Students have the flexibility to choose from the list of professional electives offered by the institute or opt to register for the equivalent MOOCS courses as suggested by the Institute. MOOCS subjects are allowed only for professional electives or open electives.

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

- ### 5.10 Provision for Early Registration of MOOCS Courses:

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

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

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

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

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

- ### 5.13 Additional learning resources:

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

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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% class strength opt 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 attendance in aggregate attendance of all the courses for that semester.
- 7.2** Shortage of attendance in aggregate upto 10% (65% and above, and 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.
- 7.4** Shortage of attendance below 65% in aggregate shall in **NO** case be condoned.
- 7.5** Students whose shortage of attendance is not condoned in any semester are not eligible to take their 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
- 7.6** 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 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 subject/ 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 (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.

9.2.1 Continuous Internal Evaluation (CIE)

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: Short Answers for 10 marks ($5 \times 2 = 10$ Marks).
- b. Part-B: Descriptive paper for 20 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 Principals 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

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given questions. The first mid-term exam will be conducted in the conventional mode using a drawing board, while the second mid-term exam will be conducted using a CAD package.

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

1. Missed one or 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 average marks of the two mid exams (or) the CBT exam marks whichever is the best that marks will be considered as final marks. CBT exams shall be conducted by the College.

9.4 Semester End Theory Examination

9.4.1 Theory Courses:

The semester end examinations (SEE), for theory courses, will be conducted for 60 marks consisting of two parts viz. i) **PART- A** for 10 marks and ii) **PART - B** for 50 marks.

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

9.4.2 Engineering Drawing and Computer Aided Drafting Course:

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

9.4.3 Duration of SEE:

The duration of Semester End Examination of Theory courses is 3 hours.

9.5 Semester End Practical Examination

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 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 Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

The Semester End Examination 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 group colleges.

In the Semester End Examination held for 3 hours, a rubric 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.

9.6 Field-based Research Project:

There shall be a Field-based Research Project in intervening summer between II-II and III-I Semester. 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, and Supervisor of the Project and a Senior Faculty Member of the department. There shall be no internal marks for Real-Time Research Project (or) Field-based Research Project. Student shall have to earn 40%, 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 internal committee as per schedule, or (iii) secures less than 40% marks in this course.

9.7 Internship/Industry Oriented Mini Project:

There shall be an Internship/Industry Oriented Mini Project in collaboration with an industry of their specialization. Students shall register for this 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 end semester 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. There shall be no internal marks for Internship/Industry Oriented Mini Project.

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

9.8 UG Project Work

9.8.1 The UG project work shall be initiated at the beginning of the IV Year II Semester and the duration of the project work is one semester. The student must present in consultation with his supervisor, the title, objective and plan of action of his 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 project work.

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

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

- Objective(s) of the work done - 05 Marks
- Methodology adopted - 15 Marks
- Results and Discussions - 15 Marks
- Conclusions and Outcomes - 05 Marks
- Total - 40 Marks

9.8.4 The External Evaluation shall be conducted by the external examiner for a total of 60 marks. It shall comprise the presentation of the work, communication skills, and viva-voce, with a weightage of 20 marks, 15 marks, and 25 marks respectively.

The topics for main Project shall be different from the topic of Industry Oriented Mini Project/ Internship/SDC. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the External Examiner as per schedule, or (iii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

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

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

9.9 Skill Development Courses:

Four Skill Development Courses included in the Curriculum in II Year I Semester & II Semester and III Year I Semester & II Semester. Each Skill Development course carries one credit. The evaluation pattern will be the same as that for a laboratory course including internal and external assessments.

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

9.10 Value-Added Courses:

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

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 Course, Laboratory/Industry-Oriented Mini Project/Internship/Skill development course/ Project Work. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.

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

Range of percentage of Marks Secured in a course	Letter Grade (UGC Guidelines)	Grade Points
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 (i.e. $GP \geq 5$)

10.5 A student who has obtained an 'F' grade in any course shall be deemed to have 'failed' and is required to reappear 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 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 A student earns Grade Point (GP) in each course, on the basis of the letter grade secured in that course. Every student who passes a course will receive grade point $GP \geq 5$ ('C' grade or above)

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

$$\text{Credit Points (CP)} = \text{Grade Point (GP)} \times \text{Credits}$$

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

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

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

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

- 10.11 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student out of all registered courses in all semesters, and the total number of credits registered in all the semesters. 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

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

where 'M' is the total no. of courses corresponding to the best 160 credits from the courses registered in all eight semesters, 'j' is the course indicator index (takes into account all courses from 1 to 8 semesters), 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 calculation of SGPA:

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

$$\text{SGPA} = 152/20 = 7.6$$

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 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 passed 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.

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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 fulfillment of attendance requirement.
2	First year second semester to Second year first semester	(i) Regular course of study of first year second semester and fulfillment 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 fulfillment of attendance requirement.
4	Second year second semester to Third year first semester	(i) Regular course of study of second year second semester and fulfillment 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 fulfillment of attendance requirement.
6	Third year second semester to Fourth year first semester	Regular course of study of third year second semester and fulfillment of attendance requirement.
7	Fourth year first semester to Fourth year second semester	Regular course of study of fourth year first semester and fulfillment 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 the 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

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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: i) 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

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

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.

College shall undertake the responsibility of assessing the infrastructure requirements necessary to support Minor Degree programs as well as Honours degree programs during the fact-finding committee (FFC) visits to the affiliated colleges. During FFC visits, JNTUH team will physically verify the facilities available for offering the proposed Minors and Honours courses along with other regular verifications. Only the Institute approved Minors shall be offered at the affiliated colleges.

21.0 Multiple Entry Multiple Exit Scheme (MEME)

21.1 Exit Option after Second Year:

Students enrolled in the 4-Year B.Tech programme 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) or submit the Internship/apprenticeship report as per the College schedule and guidelines.

21.3 Re-entry into the B.Tech Programme

Students who have exited the B.Tech Programme with a 2-Year UG Diploma may apply for re-entry into the Third Year (Fifth Semester) of the B.Tech programme. 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 programme and same college from which the student exited. Before rejoining, students should check for the branch closure. If the branch is closed in that particular 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 their studies without a gap after being awarded the diploma, they must register for the third-year courses before the commencement of class work.

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 Institute 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.

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

22.6 Look Up Table of equivalence courses

22.6.1 A lookup table will be provided for the benefit of students. This lookup table will include all the courses to be registered by students who have been re-admitted under the R25 Academic Regulations from the R22 Academic Regulations. Separate lookup tables will be provided for the following categories of students:

1. Students re-admitted into the I Year II Semester of the R25 Regulations
2. Students re-admitted into the II Year I Semester of the R25 Regulations
3. Students re-admitted into the II Year II Semester of the R25 Regulations,
4. Students re-admitted into the III Year I Semester of the R25 Regulations
5. Students re-admitted into the III Year II Semester of the R25 Regulations
6. Students re-admitted into the IV Year I Semester of the R25 Regulations
7. Students re-admitted into the IV Year II Semester of the R25 Regulations

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

22.6.2 Applicability of Look-up Table: The above look-up table shall be applicable for i) students who seek readmission from R22 regulations to R25 regulation and are going to be re-admitted in the same autonomous college ii) detained students of one autonomous college who seek admission into another autonomous college.

For these two categories of students, the Principals of the affiliated colleges need not consult the University for the Equivalence Courses. However the Principals need to inform in the specified format, the list of such students and equivalences derived from the transitory regulations.

22.7 Look-Up Table is not applicable for the students who seek transfer from i) other Universities to JNTUH affiliated colleges, ii) autonomous to non-autonomous colleges iii) one autonomous to another autonomous colleges and iv) non-autonomous to autonomous colleges under JNTUH. Such students should consult the University regarding equivalent courses, as was done in previous practice.

22.8 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 There shall be no transfers from one college to another within the constituent colleges and units of Jawaharlal Nehru Technological University Hyderabad.

23.3 The students seeking transfer to colleges affiliated to JNTUH from various other Universities/institutions is having back-logs at the previous University/institute, have to pass the courses offered at JNTUH which are equivalent to the failed courses at the previous University/institute.

23.4 The transferred students from other Universities/Institutions to JNTUH affiliated colleges shall be given a chance to write CBTs for getting CIE component in the equivalent course(s) as per the clearance letter issued by the University.

24.0 Value Added Courses

24.1 Faculty members who have received a certificate in Innovation and Entrepreneurship / Entrepreneurship from a reputed foundation/organization should 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 32 hours. Faculty members from all disciplines with the right aptitude 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 16 (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 Principal 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".

ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME)
FROM THE A.Y 2026-27 (R25)

Eligibility for the award of B.Tech degree (LES):

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

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to Second year second semester	Regular course of study of second year first Semester and fulfillment of attendance requirement.
2	Second year second semester to Third year first semester	(i) Regular course of study of second year second semester and fulfillment 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 fulfillment of attendance requirement.
4	Third year second semester to Fourth year first semester	Regular course of study of third year second Semester and fulfillment of attendance requirement.
5	Fourth year first semester to Fourth year second semester	Regular course of study of fourth year first semester And fulfillment of attendance requirement.

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

Disciplinary Action For / Improper Conduct in Examinations

practical's 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 institution 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 Institute 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/assistant superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in-charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any	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.

	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.	
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 Institute 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 Exam branch 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.

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CMR Engineering College (Autonomous), Hyderabad**B.Tech. in ELECTRONICS AND COMMUNICATION ENGINEERING****COURSE STRUCTURE & SYLLABUS (R25 Regulations)****Applicable from AY 2025-26 Batch****I Year I Semester (26 Hours)**

S.No.	Course Code	Course Title	L	T	P	Credits
1.	MA101BS	Matrices and Calculus	3	1	0	4
2.	AP102BS	Advanced Engineering Physics	3	0	0	3
3.	EE103ES	Basic Electrical Engineering	3	0	0	3
4.	CS104ES	Programming for Problem Solving	3	0	0	3
5.	ME105ES	Engineering Drawing and Computer Aided Drafting	1	0	2	2
6.	AP106BS	Advanced Engineering Physics Lab	0	0	2	1
7.	EE107ES	Basic Electrical Engineering Lab	0	0	2	1
8.	CS108ES	Programming for Problem Solving Lab	0	0	2	1
9.	CM109ES	IT Workshop	0	0	2	1
10.	MS110HS	Introduction to Social Innovation	0	0	2	1
11.		Induction Program				
		Total Credits	13	01	12	20

I Year II Semester (25 Hours)

S.No.	Course Code	Course Title	L	T	P	Credits
1.	MA201BS	Ordinary Differential Equations and Vector Calculus	3	0	0	3
2.	CH202BS	Engineering Chemistry	3	0	0	3
3.	EN203HS	English for Skill Enhancement	3	0	0	3
4.	CS204ES	Data Structures	3	0	0	3
5.	CS205ES	Python Programming	3	0	0	3
6.	CH206BS	Engineering Chemistry Lab	0	0	2	1
7.	CS207ES	Data Structures Lab	0	0	2	1
8.	EC208ES	Applied Python Programming Lab	0	0	2	1
9.	EN209HS	English Language and Communication Skills Lab	0	0	2	1
10.	MS211HS	Social Innovation in Practice	0	0	2	1
		Total Credits	15	0	10	20

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II YEAR I SEMESTER (24 Hours)

S.No.	Course Code	Course Title	L	T	P	Credits
1.	EC301PC	Signals and Systems	3	1	0	4
2.	EC302PC	Probability Theory and Stochastic Processes	3	0	0	3
3.	EC303PC	Electronic Devices and Circuits	3	0	0	3
4.	EC304PC	Digital Logic Design	3	0	0	3
5.	EC305PC	Network Analysis and Synthesis	3	0	0	3
6.	EC306PC	Modelling and Simulation Lab	0	0	2	1
7.	EC307PC	Electronic Devices and Circuits Lab	0	0	2	1
8.	EC308PC	Digital Logic Design Lab	0	0	2	1
9.	EC309SD	Linux and Shell Scripting	0	0	2	1
		Total Credits	15	01	08	20

II YEAR II SEMESTER (26 Hours)

S. No.	Course Code	Course Title	L	T	P	Credits
1.	EC401PC	Electromagnetic Fields and Transmission Lines	3	1	0	4
2.	MA402BS	Numerical Methods and Complex Variables	3	1	0	4
3.	EC403PC	Analog and Digital Communications	3	0	0	3
4.	EC404PC	Electronic Circuit Analysis	3	0	0	3
5.	EC405PC	Linear and Digital IC Applications	3	0	0	3
6.	EC406PC	Analog and Digital Communications Lab	0	0	2	1
7.	EC407PC	Electronic Circuit Analysis Lab	0	0	2	1
8.	EC408PC	Linear and Digital IC Applications Lab	0	0	2	1
9.	EC409SD	Mobile Application Development	0	0	2	1
10.	VA411HS	Environmental Science	1	0	0	1
		Total Credits	16	02	08	22

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III YEAR I SEMESTER (26 Hours)

S.No.	Course Code	Course Title	L	T	P	Credits
1.	EC501PC	Control Systems	3	0	0	3
2.	EC502PC	RISC and Microcontroller architectures	3	0	0	3
3.	MS503HS	Business Economics and Financial Analysis	3	0	0	3
4.		Professional Elective-I / MOOCS	3	0	0	3
5.		Open Elective-I	3	0	0	3
6.	EC504PC	RISC and Microcontroller Interfacing Lab	0	0	2	1
7.	EN505HS	Advanced English Communication Skills Lab	0	0	2	1
8.	EC506PROJ	Field-Based Research Project	0	0	4	2
9.	CS507SD	Power BI	0	0	2	1
10.	VA508HS	Gender Sensitization */ Human Values and Professional Ethics*	1	0	0	1
		Total Credits	16	0	10	21

III YEAR II SEMESTER (23 Hours)

S.No	Course Code	Course Title	L	T	P	Credits
1.	EC601PC	Antenna Design and Wave Propagation	3	0	0	3
2.	EC602PC	CMOS VLSI Design	3	0	0	3
3.	EC603PC	Digital Signal Processing	3	1	0	4
4.		Professional Elective-II/ MOOCS	3	0	0	3
5.		Open Elective – II	3	0	0	3
6.	EC604PC	CMOS VLSI Design Lab	0	0	2	1
7.	EC605PC	Digital Signal Processing Lab	0	0	2	1
8.	EC606SD	Drone Technology Lab	0	0	2	1
9.	VA609HS	Indian Knowledge System	1	0	0	1
		Total Credits	16	01	06	20

Bray *Note: For the courses Gender Sensitization Lab and Human Values and Professional Ethics- one hour of instruction will be conducted on alternate weeks. For example, if a one-hour class for Gender Sensitization Lab is conducted this week, then a one-hour class for Human Values and Professional Ethics will be conducted in the following week.

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IV YEAR I SEMESTER (27 Hours)

S.No.	Course Code	Course Title	L	T	P	Credits
1.	EC701PC	Microwave and Optical Communications	3	0	0	3
2.	EC702PC	IoT Architectures and Protocols	3	0	0	3
3.		Professional Elective-III/ MOOCS	3	0	0	3
4.		Professional Elective – IV / MOOCS	3	0	0	3
5.		Open Elective – III	3	0	0	3
6.	EC703PC	Microwave and Optical Communications Lab	0	0	2	1
7.	EC704PC	IoT Architectures and Protocols Lab	0	0	2	1
8.	EC705PROJ	Industry Oriented Mini Project/ Internship	0	0	4	2
9.	EC706SEM	Technical Seminar	0	0	4	2
		Total Credits	15	0	12	21

IV YEAR II SEMESTER (34 Hours)

S.No.	Course Code	Course Title	L	T	P	Credits
1.		Professional Elective – V/ MOOCS	3	0	0	3
2.		Professional Elective – VI/ MOOCS	3	0	0	3
3.	EC801PROJ	Project Work	0	0	28	14
		Total Credits	06	0	28	20

*Note: Students who wish to exit after II Year II Semester has to register for this optional course and acquire the credits allotted by doing 6 weeks Work-based Vocational Course/ Internship or Apprenticeship. Please refer R25 Academic Regulations for more information.

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PROFESSIONAL ELECTIVES**Professional Elective - I**

EC511PE	Sustainability for Electronics
EC512PE	CMOS Fabrication and Technology
EC513PE	Data Communications and Computer Networks
EC514PE	Computer Organization and Operating Systems

Professional Elective - II

EC621PE	Embedded System Design
EC622PE	Network Security and Cryptography
EC623PE	5G Communications
EC624PE	Image and Video Processing

Professional Elective-III

EC731PE	Biomedical Signal and Image Processing
EC732PE	Wireless Communication Networks
EC733PE	Design for Testability
EC734PE	Low Power VLSI Design

Professional Elective-IV

EC741PE	Artificial Intelligence & Machine Learning
EC742PE	Quantum Technologies
EC743PE	Electronic Measurements and Instrumentation
EC744PE	Biomedical Instrumentation

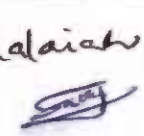
Professional Elective-V

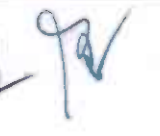
EC851PE	AI for Signal and Image Processing
EC852PE	Radar Systems
EC853PE	Intelligent e - Computer Aided Design
EC854PE	Analog and Mixed Signal IC Design

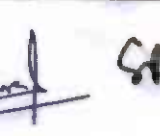
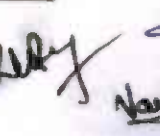
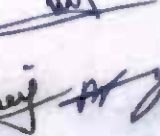
Professional Elective-VI

EC861PE	DSP Processors and Architectures
EC862PE	Satellite Communications
EC863PE	RF Circuit Design
EC864PE	Model Based System Engineering

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OPEN ELECTIVES

Open Elective-I:

EC511OE	Principles of Communication
EC512OE	Fundamentals of Cyber Physical Systems
EC513OE	Electronic Measurements and Instrumentation

Open Elective-II:

EC621OE	Fundamentals of Image Processing
EC622OE	Automotive Electronics
EC623OE	Introduction to Embedded Systems

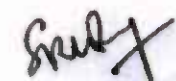
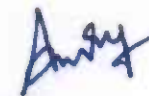
Open Elective-III:

EC731OE	Introduction to wireless Communications
EC732OE	Electronics for Health Care
EC733OE	IOT Protocols and its Applications

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CMR Engineering College (Autonomous), Hyderabad**B.Tech. in ELECTRONICS AND COMMUNICATION ENGINEERING****COURSE STRUCTURE & SYLLABUS (R25 Regulations)****Applicable from AY 2025-26 Batch****I Year I Semester (26 Hours)**

S.No.	Course Code	Course Title	L	T	P	Credits
1.	MA101BS	Matrices and Calculus	3	1	0	4
2.	AP102BS	Advanced Engineering Physics	3	0	0	3
3.	EE103ES	Basic Electrical Engineering	3	0	0	3
4.	CS104ES	Programming for Problem Solving	3	0	0	3
5.	ME105ES	Engineering Drawing and Computer Aided Drafting	1	0	2	2
6.	AP106BS	Advanced Engineering Physics Lab	0	0	2	1
7.	EE107ES	Basic Electrical Engineering Lab	0	0	2	1
8.	CS108ES	Programming for Problem Solving Lab	0	0	2	1
9.	CM109ES	IT Workshop	0	0	2	1
10.	MS110HS	Introduction to Social Innovation	0	0	2	1
11.		Induction Program				
		Total Credits	13	01	12	20

I Year II Semester (25 Hours)

S.No.	Course Code	Course Title	L	T	P	Credits
1.	MA201BS	Ordinary Differential Equations and Vector Calculus	3	0	0	3
2.	CH202BS	Engineering Chemistry	3	0	0	3
3.	EN203HS	English for Skill Enhancement	3	0	0	3
4.	CS204ES	Data Structures	3	0	0	3
5.	CS205ES	Python Programming	3	0	0	3
6.	CH206BS	Engineering Chemistry Lab	0	0	2	1
7.	CS207ES	Data Structures Lab	0	0	2	1
8.	EC208ES	Applied Python Programming Lab	0	0	2	1
9.	EN209HS	English Language and Communication Skills Lab	0	0	2	1
10.	MS211HS	Social Innovation in Practice	0	0	2	1
		Total Credits	15	0	10	20

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Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401

INBAI



Course Code: MA101BS

Matrices and Calculus

(I B. Tech I SEMESTER COMMON TO CSM, CSD & ECE)

L T P C

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Pre-requisites: Mathematical Knowledge at pre-university level

Objectives:

To learn

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

UNIT-I: Matrices

8 L

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

UNIT-II: Eigen values and Eigen vectors

10 L

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

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UNIT-III: Single Variable Calculus

10 L

Limit and Continuous 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 the theorems without proof).

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

10 L

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

UNIT-V: Multivariable Calculus (Integration)

10 L

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

Course outcomes:

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

- Write the matrix representation of a set of linear equations and to analyze the solution of the system of equations
- Apply the concept of Eigen values, Eigen vectors in Cayley Hamilton theorem and Quadratic forms.
- Solve the applications of the mean value theorems.
- Find the extreme values of functions of two variables with/ without constraints.
- Evaluate the multiple integrals and apply the concept to find areas, volumes.

Text Books:

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

References:

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

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Syllabus for BOS Approval
Regulations R-25

AP102BS/AP202BS: ADVANCED ENGINEERING PHYSICS (R25)

Ist Year B.Tech I/II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

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

Course Outcomes:

CO1: Apply quantum mechanical principles to explain electron behavior in confined systems, formation of energy bands, and classification of solids.

CO2: Analyze the properties and working of semiconductor devices (diodes, LEDs, solar cells) and nanomaterials, including their synthesis and characterization techniques.

CO3: Interpret the concepts of qubits, quantum gates, and entanglement in the context of quantum computing, and differentiate quantum computing from classical computing.

CO4: Explain the classification, properties, and applications of magnetic and dielectric materials in engineering systems.

CO5: Describe the principles, construction, and applications of lasers and optical fibres, including their use in communication and sensing.

UNIT - I: Quantum Mechanics

10hrs

Introduction, de-Broglie hypothesis, Heisenberg uncertainty principle, physical significance of wave function, postulates of quantum mechanics: operators in quantum mechanics, eigen values and eigen functions, expectation value; 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.

UNIT - II: Semiconductor Physics & Nanotechnology

10hrs

Intrinsic and extrinsic semiconductors – Hall effect – direct and indirect band gap semiconductors – construction, principle of operation and characteristics of P-N Junction diode, structure, materials, working principle and characteristics: LED and solar cell.

Introduction to nano science and nano technology, surface to volume ratio, quantum confinement, synthesis of nano materials using sol-gel method, ball milling method, X-ray

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5. *[Signature]* 6. *[Signature]* 7. *[Signature]* 8. *A. Samuel Kumar*

diffraction: powder method, calculation of average crystallite size using Debye Scherrer's formula, block diagram, working principle: scanning electron microscopy (SEM).

UNIT - III: Quantum Computing

10hrs

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, quantum computing system for information processing, evolution of quantum systems, quantum measurements, entanglement, quantum gates, challenges and advantages of quantum computing over classical computation.

UNIT - IV: Magnetic and Dielectric Materials

10hrs

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

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

UNIT - V: Laser and Fibre Optics

10hrs

Introduction to laser, characteristics of laser, Einstein coefficients and their relations, metastable state, population inversion, pumping, lasing action, Ruby laser, He-Ne laser, CO₂ laser, semiconductor diode laser, applications of lasers.

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

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
4. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.

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.

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EE103ES / EE201ES: BASIC ELECTRICAL ENGINEERING
(Common for CSE, CSM, CSD, ECE)

B.Tech. I Year I Sem / II Sem

L	T	P	C
3	0	0	3

Prerequisites: Mathematics and Physics.

Course Objectives:

- To introduce the concepts of electrical circuits and its components.
- To understand magnetic circuits, DC circuits and AC single phase and three phase circuits.
- To study and understand behaviour of transformers.
- To study and understand behaviour of DC machines.
- To study and understand behaviour of AC machines.

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

CO1. Apply circuit laws and theorems to determine the response of circuits.

CO2. Analyze and solve both the theoretical and practical problems of series and parallel AC circuits.

CO3. Estimate the losses and efficiency of electrical machines.

CO4. Examine the characteristics of DC machines.

CO5. Evaluate various performance parameters of AC machines.

UNIT- I: D.C CIRCUITS

Electrical circuit elements (R,L,C), voltage and current sources, KVL & KCL, analysis of simple circuits with DC excitation. Superposition, Thevenin's and Norton's theorems. Time-domain analysis of first – order RL and RC circuits.

UNIT-II: A.C CIRCUITS

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

UNIT-III: TRANSFORMERS

Transformer Construction, working principle, emf equation, ideal and practical transformer, equivalent circuits, losses in transformers, regulations and efficiency. Auto-transformer construction, working and three-phase transformer connections.


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Head
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School Of Engineering, Anurag University
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Medchal-Malkajgiri(D), 500088, TS.

UNIT-IV: DC MACHINES

DC Generators: Construction, working, emf equation and classification. DC Motors: construction, working, back emf, torque equation, classification, characteristics, Losses and efficiency.

UNIT-V: AC MACHINES

Generation of rotating magnetic fields . construction and working of a three-phase induction motor, significance of torque-slip characteristic, Losses and efficiency, construction and working of synchronous generators.

TEXT BOOKS:

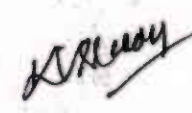
1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition, 2008.

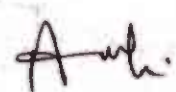
REFERENCE BOOKS:

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

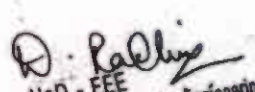

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School Of Engineering, Aarav University
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HoD - EEE
Department of Electrical and Electronics Engineering
Geethanjali College of Engineering & Technology
(Autonomous)
Cheeraj (V), Keesara (M), Medchal (D), Telangana-501301.

CS104ES: PROGRAMMING FOR PROBLEM SOLVING
(Common to CSE, ECE, CSM & CSD)

B.Tech. I Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of the C programming language.
- To learn the usage of structured programming approaches in solving problems.

Course Outcomes: The student will learn

- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in the C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to write C programs.
- Searching and sorting problems.

UNIT - I

Overview of C: History of C, Creating and Running Programs, Character Set, Tokens, Keywords, Identifiers, Constants, variables and data types, input and output statements, types of operators, precedence of operators, type conversion, Structure of C Program, Errors.

Selection Structures: if, if-else, nested if, switch-case, ternary operator, goto statement.

Repetition and Loop Statements: Iteration with for, while, do- while, break, continue Nested Loops.

Standard problems: [GCD, finding roots, generating factors of a number, Checking for leap year],
Number series problems (Fibonacci series, natural numbers, even numbers, prime numbers, multiplication table, palindrome numbers).

UNIT - II

Top-Down Design with Functions: Declaring a function, Signature of a function, passing parameters to functions.

Storage Class: External, Auto, Local, Static, Register Variables.

UNIT - III

Arrays: one- and two-dimensional arrays, creating, accessing and manipulating elements of arrays, Using Array Elements as Function Arguments, Parallel Arrays and Enumerated Types, Multidimensional Arrays.

standard problems (addition and multiplication of two matrixes, Mean, Variance, SD, maximum and minimum elements using arrays).

Strings: Declaring, Initializing, string input and output functions, string handling functions., Longer Strings: Concatenation and Whole-Line Input.

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UNIT – IV

Recursion: The Nature of Recursion, Recursive Function, Recursive Mathematical Functions, Recursive Functions with Array and String Parameters

Structure and Union Types: Defining structures, initializing structures, Array of structures. Union Types.

Pointers: Pointer, pointer to pointer, pointers and functions (call by reference) arguments, pointers and arrays, address arithmetic.

UNIT - V

Text and Binary File Pointers: Creating, Reading, writing text and binary files, Random access using fseek, ftell and rewind functions.

Searching and Sorting: Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms).

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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ME105ES / ME205ES: ENGINEERING DRAWING AND COMPUTER AIDED DRAFTING
(Common to ECE, CSE, CSM & CSD)

B.Tech. I Year I & II Sem.

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Course Objectives:

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

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

1. Understand and apply the principles of orthographic and isometric projections.
2. Create sectional views and dimensioned drawings using BIS standards.
3. Use CAD software to generate 2D engineering drawings.
4. Visualize and construct solid models from 2D views.
5. Demonstrate drafting skills for practical and industrial applications.

UNIT – I: Introduction to Engineering Graphics (Conventional)

Principles of Engineering Graphics and their Significance, Geometrical Constructions, Scales, Plain and Diagonal, Conic Sections: Ellipse, Parabola, Hyperbola, General method only, Engineering curves: Cycloid.

UNIT – II: Orthographic Projections (Conventional & Computer Aided)

Principles of Orthographic Projections, Conventions, Projections of Points and Lines, Projections of Plane (Inclined to one plane), Computer aided orthographic projections, points, lines and planes. Introduction to Computer aided drafting, views and commands.

UNIT – III: Projections of Regular Solids (Conventional & Computer Aided)

Regular Solids, Prism, Cylinder, Pyramid, Cone (Inclined to one plane), Computer aided projections of solids, Prism, Cylinder, Pyramid, Cone (Inclined to both plane).

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

UNIT – V: Isometric Projections (Conventional & Computer Aided)

Principles of Isometric Projection, Isometric Scale, Isometric Views, Conventions, Isometric Views of Lines, Plane Figures, Simple and Compound Solids, Isometric Projection of objects having non, isometric lines. Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions. Conversion of orthographic projection into isometric view.

Note:

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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(Dr. V. Navaneeth)

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CMR ENGINEERING COLLEGE

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AP106BS/AP206BS: ADVANCED ENGINEERING PHYSICS LAB(R25)

Ist Year B.Tech I/II Sem.

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Course Objectives:

The course aims to:

1. **Demonstrate** the fundamental concepts of modern physics, solid state physics, and optoelectronic devices through hands-on experiments.
2. **Familiarize** students with experimental techniques, measurement methods, and the use of scientific instruments in semiconductor, optical, and magnetic studies.
3. **Develop** skills in data collection, analysis, and interpretation to draw meaningful physical conclusions.
4. **Strengthen** the connection between theoretical principles and practical applications in electronics, photonics, and materials science.
5. **Encourage** problem-solving, teamwork, and scientific reporting skills essential for engineering practice.

Course Outcomes:

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

CO1:Determine physical constants such as Planck's constant, work function, and semiconductor bandgap using appropriate experimental methods.

CO2:Analyze the electrical characteristics of semiconductor devices (p-n junction diode, Zener diode, LED, solar cell, laser diode) and interpret their behavior in practical circuits.

CO3:Measure material parameters such as Hall coefficient, carrier concentration, resistivity, and magnetic hysteresis, and relate them to material properties.

CO4:Characterize optical systems including lasers and optical fibers, determining wavelength, numerical aperture, and losses.

CO5:Apply theoretical knowledge to experimental observations, perform error analysis, and present results in a structured scientific format.

List of Experiments:

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of energy gap of a semiconductor.
3. Determination of Hall coefficient and carrier concentration of a given semiconductor.
4. a) V-I and L-I characteristics of light emitting diode (LED).

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- b) V-I Characteristics of solar cell.
5. Determination of dielectric constant of a given material.
 6. Stewart – Gee's experiment: Determination of magnetic field along the axis of a current carrying coil.
 7. Determination of the resistivity of semiconductor by two probe method.
 8. Study of B-H curve of a ferro magnetic material.
 9. a. Determination of wavelength of a laser using diffraction grating.
b. Study of V-I & L-I characteristics of a given laser diode.
 10. a. Determination of numerical aperture of a given optical fibre.
b. Determination of bending losses of a given optical fibre.

Note: Any 8 experiments are to be performed.

REFERENCE BOOK:

1. Applied Physics Lab Manual, CMREC, Hyd.
2. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

1. for 2. KV Reddy 3. Dr. C. R. Reddy 4. M. S. Reddy
5. Dr. Reddy 6. Dr. Reddy 7. Dr. Reddy 8. A. Suresh Kumar

EE107ES/EE209ES: BASIC ELECTRICAL ENGINEERING LAB
(Common for CSE, CSM, CSD, ECE)

B.Tech. I Year I Sem / II Sem.

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Prerequisites: Mathematics and Physics.

Course Objectives:

- To analyze a given network by applying various electrical laws and network theorems.
- To know the response of electrical circuits for different excitations
- To calculate, measure and know the relation between basic electrical parameters.
- To analyze the performance characteristics of DC and AC electrical machines.

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

CO1. **Apply** basic circuit laws and theorems for circuits.

CO2. **Analyze** the response of electrical circuits to different excitations.

CO3. **Evaluate** the efficiency and regulation electrical machines.

CO4. **Examine** starting and running performance of electrical machines.

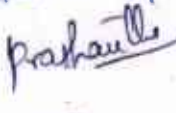
CO5. **Estimate** the performance characteristics of electrical machines.

List of experiments/demonstrations:

1. Verification of Ohms Law.
2. Verification of KVL and KCL.
3. Transient Response of Series RL, RC and RLC circuits using DC excitation.
4. Verification of Thevenin's and Norton's theorems.
5. Verification of Superposition theorem.
6. Resonance in series RLC circuit.
7. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits.
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation).
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star).
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit.
11. Performance Characteristics of DC Shunt Motor.
12. Performance Characteristics of a Three-phase Induction Motor.
13. No-Load Characteristics of a Three-phase Alternator.


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TEXT BOOKS:

D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.

MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition, 2008.

REFERENCE BOOKS:

P. Ramana, M. Suryaikalavathi, G.T.Chandrasheker, "Basic Electrical Engineering", S. Chand, 2nd Edition, 2019.

D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009

M. S. Sukhija, T. K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition, 2012.

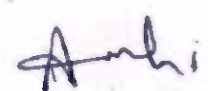
Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic Electrical Engineering", 2nd Edition, McGraw Hill, 2021.

L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.

E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

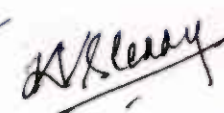
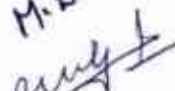
V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

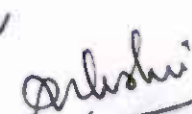

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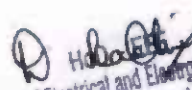

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CS108ES: PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to CSE, ECE, CSM & CSD)

B.Tech. I Year I Sem.

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[Note: The programs may be executed using any available Open Source/ Freely available IDE

Some of the Tools available are:

CodeLite: <https://codelite.org/>

Code::Blocks: <http://www.codeblocks.org/>

DevCpp : <http://www.bloodshed.net/devcpp.html>

Eclipse: <http://www.eclipse.org>

This list is not exhaustive and is NOT in any order of preference]

Course Objectives: The students will learn the following:

- To work with an IDE to create, edit, compile, run and debug programs
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To Write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files

Course Outcomes: The candidate is expected to be able to:

- formulate the algorithms for simple problems
- translate given algorithms to a working and correct program
- correct syntax errors as reported by the compilers
- identify and correct logical errors encountered during execution
- represent and manipulate data with arrays, strings and structures
- use pointers of different types
- create, read and write to and from simple text and binary files
- modularize the code with functions so that they can be reused

PRACTICE SESSIONS:

WEEK-1

Simple numeric problems:

- a) Write a program for finding the max and min from the three numbers.
- b) Write the program for the simple, compound interest.
- c) Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:

$$5 \times 1 = 5$$

$$5 \times 2 = 10$$

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$$5 \times 3 = 15$$

- d) Write a program that shows the binary equivalent of a given positive number between 0 to 255.

WEEK-2

Expression Evaluation:

- Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use Switch Statement).
- Write a program that finds if a given number is a prime number.
- Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
- A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

WEEK-3

Arrays,

- Write a C program to find the minimum, maximum and average in an array of integers.
- Write a C program that uses functions to perform the following:
 - Addition of Two Matrices
 - Multiplication of Two Matrices

WEEK-4

Pointers and Functions:

- Write a program for reading elements using a pointer into an array and display the values using the array.
- Write a program for display values reverse order from an array using a pointer.

WEEK-5

Files:

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

WEEK-6

Strings:

- Write a C program that uses functions to perform the following operations:
 - To insert a sub-string into a given main string from a given position.
 - To delete n Characters from a given position in a given string

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CM109ES/CS210ES: IT WORKSHOP
(Common for CSE, ECE, CSM & CSD)

B.Tech. I Year I / II Sem.

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Course Objectives: The IT Workshop for engineers is a training lab course spread over 60 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel, PowerPoint and Publisher.

Course Outcomes:

- Perform Hardware troubleshooting
- Understand Hardware components and inter dependencies
- Safeguard computer systems from viruses/worms
- Document/ Presentation preparation
- Perform calculations using spreadsheets

PC Hardware

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

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

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

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

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

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

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to

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block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

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

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

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each: Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

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

Task 2: Calculating GPA - Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP

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

PowerPoint

Task 1: Students will be working on basic power point utilities and tools which help them create basic PowerPoint presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

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

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

REFERENCE BOOKS:

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

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3. Introduction to Information Technology, ITL Education Solutions limited, *Pearson Education*.
4. PC Hardware - A Handbook - Kate J. Chase *PHI* (Microsoft)
5. LaTeX Companion - Leslie Lamport, *PHI/Pearson*.
6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. - *CISCO Press, Pearson Education*.
7. IT Essentials PC Hardware and Software Labs and Study Guide Third Edition by Patrick Regan - *CISCO Press, Pearson Education*.

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MS110HS: INTRODUCTION TO SOCIAL INNOVATION

(Common to ECE, CSE, CSD, CSM)

B.Tech. I Year I Sem

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COURSE OBJECTIVES:

1. To introduce students to the concepts and evolution of social innovation and design thinking.
2. To help learners understand the role of CSR and global/Indian perspectives in addressing social challenges.
3. To familiarize students with the Sustainable Development Goals (SDGs) and their practical applications.
4. To encourage community engagement through observation, gap analysis, and documentation.
5. To enable students to generate, refine, and evaluate innovative ideas through ideation techniques and case studies.

COURSE OUTCOMES:

1. Students are able to understand the social innovation and its role in solving societal problems.
2. Students are able to use design thinking (Empathize, Define, Ideate, Prototype, Test) to create solutions.
3. Students are able to identify and map Sustainable Development Goals (SDGs) to real-world activities.
4. Students are able to observe and document community issues through field visits.
5. Students are able to create, and pitch innovative ideas for social change.

Unit 1 – Introduction to Social Innovation: Definition, types, global and local social innovations & evolution of social innovation, Importance of innovation in addressing societal challenges.

Unit 2–Design Thinking: Concepts, principles & significance, Stages of design thinking: Empathize, Define, Ideate, Prototype, and Test.

Unit 3–SDGs (Sustainable Development Goals): Overview of the SDGs- Zero hunger, Good health and Well being, Quality education, Affordable and Clean Energy etc. Mapping of SDGs with activities.

Unit 4–Community Engagement: Field visit for Rural, Semi Urban and Urban, observation of field problems/issues, Documentation of observations.

Unit 5–Ideation and Presentation: Case studies on Ideas, ideation & ideation techniques, Idea selection, Idea pitching.

RS

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Renuka

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Satish

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J. Kalpana

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Jasir

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B. Suresh

References:

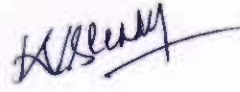
1. Murray, R., Caulier-Grice, J., & Mulgan, G. (2010). *The Open Book of Social Innovation*. NESTA.
2. Brown, T. (2009). *Change by Design: How Design Thinking Creates New Alternatives for Business and Society*. Harper Business.
3. Sachs, J. D. (2015). *The Age of Sustainable Development*. Columbia University Press.
4. IDEO.org. *The Field Guide to Human-Centered Design*. IDEO.
5. United Nations. *Transforming Our World: The 2030 Agenda for Sustainable Development*.
6. Dees, J. G. (2001). *The Meaning of Social Entrepreneurship*. Duke University.
7. *Frontiers in Social Innovation*. Neil Malhotra 2022.
8. *The International Hand book on Social Innovation (for Casestudies)*. Frank Moulaert, Dian Maccallum, Abid Mehmood, Abdelillah, handouch (ed)





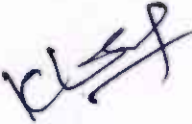
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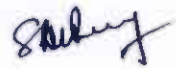




J. Kapans







B Swaps





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Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401



Course Code: MA201BS

Ordinary Differential Equations and Vector Calculus

(I B. Tech II SEMESTER COMMON TO CSM, CSD & ECE)

L	T	P	C
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Pre-requisites: Mathematical Knowledge at pre-university level

Objectives:

To learn

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

UNIT-I: First Order Ordinary Differential Equations

8 L

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

UNIT-II: Ordinary Differential Equations of Higher Order

10 L

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

10 L

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 integrals by Laplace transforms – Inverse Laplace transform by different methods, convolution theorem (without proof). Applications:

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solving Initial value problems by Laplace Transform method.

UNIT-IV: Vector Differentiation

10 L

Vector point functions and scalar point functions – Gradient – Divergence and Curl – Directional derivatives – Vector Identities (without Proofs) – Scalar potential functions – Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration

10 L

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

Course outcomes:

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

- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems.
- Use the Laplace Transforms techniques for solving Ordinary Differential Equations.
- Determine gradient, divergent and curl by using vector differentiation.
- Evaluate the Line, Surface and Volume integrals and converting them from one to another

Text Books:

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

References:

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

M. Kumar
H. V. R.

ENGINEERING CHEMISTRY
CSE (1) and CSE allied Branches (AIML,CSD) /ECE(2)
(Pattern 1 & 2)

B. Tech. I Year

L T P C
3 0 0 3

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 impart foundational knowledge of various energy sources and their practical applications in engineering
3. 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.
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. Identify the different types of boiler troubles, choose appropriate method for softening and cleaning of water
2. Describe various parameters that are utilized to characterize fuels and its combustion process.
3. Comprehend the significance and practical applications of batteries and various energy sources, enhancing their potential as future engineers and entrepreneurs.
4. Compare and contrast the chemical behavior & physical properties of polymers
5. Apply the principles of UV-Visible, IR spectroscopy and Raman spectroscopy in analyzing pollutants in dye industries and biomedical applications.

UNIT-I: Water and its treatment:

[10 hr]

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

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

UNIT-II: Energy sources:

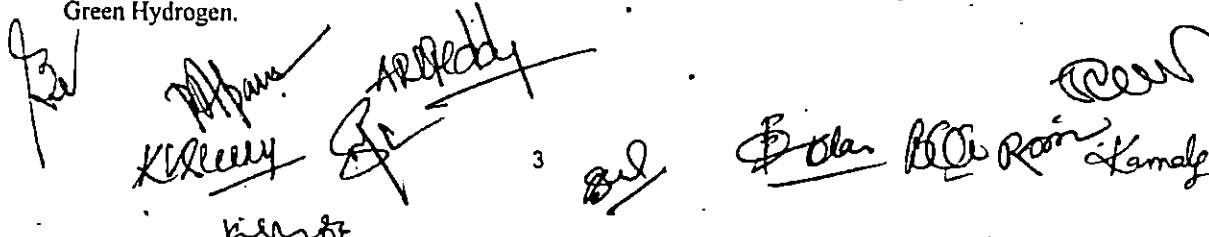
[10 hr]

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

Fuels: Introduction and characteristics of a good fuel, Calorific value - Units - HCV, LCV- Dulong's 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.


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Unit-III: Electrochemistry and Corrosion:

[10 hr]

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

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

UNIT - IV: Polymers:

[10 hr]

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 thermoplastics and thermo setting plastics, Fiber reinforced plastics (FRP).

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

Biodegradable polymers: Polylactic acid and its applications.

UNIT-V- Advanced Functional Materials:

[10 hr]

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.

SUGGESTED 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 TEXT BOOKS:

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

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



CMR ENGINEERING COLLEGE

UGC AUTONOMOUS

(Approved by AICTE - New Delhi. Affiliated to JNTUH and Accredited by NAAC & NBA)



I Year B.Tech (Common to All Branches)

L T P C
3 0 0 3

English for Skill Enhancement

COURSE CODE: EN103HS/EN203HS

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.

LEARNING OBJECTIVES

-- This course will enable the students to:

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

COURSE OUTCOMES

Students will be able to:

CO-1: Choose appropriate vocabulary in their oral and written communication.

CO-2: Compare and Contrast the given text and respond appropriately.

CO-3: Demonstrate their understanding of the rules of functional grammar.

CO-4: Develop comprehension skills from the known and unknown passages.

CO-5: Write paragraphs, essays, Précis and draft letters

SYLLABUS

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

Unit -I

Theme: Perspectives

Lesson on 'The Generation Gap' by Benjamin M. Spock from the prescribed textbook titled *English for the Young in the Digital World* published by Orient 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 Articles and Prepositions

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

Writing: Sentence Structures - Importance of Proper Punctuation- Techniques for Writing Precisely. Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence – Linkers and Connectives

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, Degrees of Comparison.

Reading: Reading Strategies-Guessing Meaning from Context - Identifying Main Ideas

Writing: Defining- Describing People, Objects, Places and Events - 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

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

Reading: Sub-Skills of Reading -Intensive Reading and Extensive Reading

Writing: Format of a Formal Letter-Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Job Application with CV/Resume - 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 - Phrasal Verbs - Idioms.

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

Reading: Prompt Engineering Techniques- Comprehending and Generating Appropriate Prompts

Writing: 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

Reading: Survey, Question, Read, Recite and Review (SQ3R Method)

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

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CS204ES: DATA STRUCTURES
(Common to CSE, ECE, CSM & CSD)

B.Tech. I Year II Sem.

L	T	P	C
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Prerequisites: A course on "Programming for Problem Solving"

Course Objectives

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
- Introduces sorting and pattern matching algorithms.

Course Outcomes

- Ability to select the data structures that efficiently model the information in a problem.
- Ability to assess efficiency trade-offs among different data structure implementations or combinations.
- Implement and know the application of algorithms for sorting and pattern matching.
- Design programs using a variety of data structures, including hash tables, binary and general tree structures, search trees, tries, heaps, graphs, and AVL-trees.

UNIT - I

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

UNIT - II

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

UNIT - III

Multi way Search Trees: Introduction, B Trees, B Trees ADT, 2-3 Trees, , B* Tree, B+ Trees
Heaps: Binary Heaps, Binomial heaps, Fibonacci heaps, Comparison of Various Heaps, Applications
Searching: Introduction, Interpolation Search, Jump search

UNIT - IV

Graphs: Introduction, Directed Graphs, Bi connected Components, Representation of Graphs, Graph Traversal Algorithms(BFS and DFS), Graph ADT, Applications of Graphs
Sorting: Radix Sort, Heap sort, Shell Sort, Tree Sort,

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UNIT - V

Hashing and Collision: Introduction, Hash Tables, Hash Functions, Different Hash Functions: Division Method, Multiplication Method, Mid-square Method, Folding Method;
collisions: Collision Resolution by Open Addressing, Collision Resolution by Chaining

TEXT BOOKS:

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

REFERENCE BOOK:

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

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CS205ES: PYTHON PROGRAMMING (ECE)

B.Tech. I Year II Sem.

L T P C

3 0 0 3

Prerequisites: Basic knowledge of computer fundamentals, C programming.

Course Objectives:

Introduce the fundamentals of Python programming for problem-solving.

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

Course Outcomes:

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

UNIT-1 – Introduction to Python and Basics of Programming

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

UNIT-2 – Data Structures in Python

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

UNIT-3 – Functions and Modules

Functions: Defining, Calling, Parameters, Return Values, Types of Arguments: Positional, Keyword, Default, Variable Length, Scope of Variables: Local and Global, Lambda Functions, Map, Filter, Reduce, Recursion in Python, Modules:

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Importing, Creating User-defined Modules, Standard Modules (math, random, date time), Packages in Python.

UNIT-4 – File Handling and Exception Handling

File Handling: Opening, Reading, Writing, Appending, File Modes, File Methods, Working with CSV and JSON Files.

Exception Handling: try, except, else, finally, Built-in Exceptions, Raising Exceptions, Introduction to Regular Expressions (re module).

UNIT-5 – Object-Oriented Programming and Applications

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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ENGINEERING CHEMISTRY LABORATORY

CSE (1) and CSE allied Branches (AIML/CSD) /ECE(2)
(Pattern 1&2)

B. Tech. I Year

L T P C
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Course Description:

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

Course Objectives

1. Students will understand and perform experiments based on core chemical principles relevant to engineering applications.
2. Students will learn to estimate the hardness of water to assess its suitability for drinking purposes.
3. Students will acquire the ability to perform acid-base titrations using instrumental methods such as conductometry, potentiometry, and pH metry.
4. Students will gain hands-on experience in synthesizing polymers like Bakelite and Nylon - 6, 6 in the laboratory.
5. Students will learn to determine the unknown concentration of potassium permanganate (KMnO_4) using a calibration curve.

Course Outcomes:

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

List of Experiments:

I. Volumetric Analysis:

Estimation of Hardness of water by EDTA Complexometry method.

II. Conductometry:

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

III. Potentiometry:

1. Estimation of concentration of Fe^{2+} ion by Potentiometry using KMnO_4 .
2. Estimation of concentration of strong acid with strong base by Potentiometry using quinhydrone

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

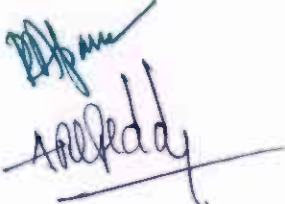
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- V. **Colorimetry:** Verification of Lambert-Beer's law using KMnO_4 .
- VI. **Preparations:**
 1. Preparation of Bakelite.
 2. Preparation Nylon - 6, 6.
- VII. **Corrosion:** Determination of rate of corrosion of mild steel in the presence and absence 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:

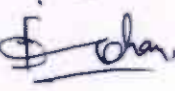
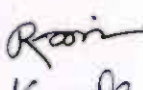
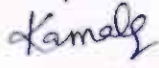
1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications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

Board of Studies members:





CS207ES: DATA STRUCTURES LAB
(Common to CSE, ECE, CSM & CSD)

B.Tech I Year II Sem

L	T	P	C
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Prerequisites: A Course on "Programming for problem solving".

Course Objectives:

- It covers various concepts of C programming language
- It introduces searching and sorting algorithms
- It provides an understanding of data structures such as stacks and queues.

Course Outcomes:

- Ability to develop C programs for computing and real life applications using basic elements
- Like control statements, arrays, functions, pointers and strings.
- Implement the data structures like stacks, queues and linked lists.
- Ability to Implement searching and sorting algorithms • Implement the various Graph and Tree traversal techniques.

List of Experiments:

1. Write a program that uses functions to perform the following operations on singly linked list:
i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list:
i) Creation ii) Insertion iii) Deletion iv) Traversal
3. Write a program that uses functions to perform the following operations on circular linked list:
i) Creation ii) Insertion iii) Deletion iv) Traversal
4. Write a program that implement stack (its operations) using
i) Arrays ii) Pointers
5. Write a program that implement Queue (its operations) using
i) Arrays ii) Pointers
6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order
i) Radix Sort ii) Heap sort iii) Shell Sort iv) Tree Sort
7. Write a program to implement the tree traversal methods(Recursive and Non Recursive).
8. Write a program to implement
i) Binary Search tree ii) B Trees iii) B+ Trees iv) AVL trees v) Red - Black trees
9. Write a program to implement the graph traversal methods.

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10. Write a program to implement the following Hash Functions: i) Division Method, ii) Multiplication Method, iii) Mid-square Method, iv) Folding Method

TEXT BOOKS:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

REFERENCE BOOK:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

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EC208ES: APPLIED PYTHON PROGRAMMING LAB

B.Tech. I Year II Sem

L	T	P	C
0	0	2	1

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

LIST OF EXPERIMENTS:

Cycle - 1

1. Downloading and Installing Python and Modules
 - a) 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!)
 - b) pip3 on Windows

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/>
 - c) Installing numpy and scipy

You can install any python3 package using the command `pip3 install <packagename>`
 - d) Installing jupyterlab

Install from pip using the command `pip install jupyterlab`
2. Introduction to Python3
 - a) Printing your biodata on the screen
 - b) Printing all the primes less than a given number
 - c) Finding all the factors of a number and show whether it is a perfect number, i.e., the sum of all its factors (excluding the number itself) is equal to the number itself
3. Defining and Using Functions
 - a) Write a function to read data from a file and display it on the screen
 - b) Define a Boolean function `is_palindrome(<input>)`
 - c) Write a function `collatz(x)` which does the following: if x is odd, $x = 3x + 1$; if x is even, then $x = x/2$. Return the number of steps it takes for $x = 1$
 - d) Write a function $N(m, s) = \exp(-(x-m)^2/(2s^2))/\sqrt{2\pi}s$ that computes the Normal distribution
4. The package numpy
 - a) Creating a matrix of given order $m \times n$ containing random numbers in the range 1 to 99999
 - b) Write a program that adds, subtracts and multiplies two matrices. Provide an interface such that, based on the prompt, the function (addition, subtraction, multiplication) should be performed
 - c) Write a program to solve a system of n linear equations in n variables using matrix inverse
5. The package scipy and pyplot
 - a) Finding if two sets of data have the same mean value

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 of 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 Pilmager
- b) Installation using image file
 - Downloading an Image
 - Writing the image to an SD card using Windows
 - Booting up

Follow the instructions given in the URL

<https://www.raspberrypi.com/documentation/computers/getting-started.html>

8. Accessing GPIO pins using Python

- a) Installing GPIO Zero library.
 - First, update your repositories list:
sudo apt update
 - Then install the package for Python 3:
sudo apt install python3-gpiozero
- b) Blinking an LED connected to one of the GPIO pin
- c) Adjusting the brightness of an LED
- d) Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength.

9. Collecting Sensor Data

- a) DHT Sensor interface
 - Connect the terminals of DHT GPIO pins of Raspberry Pi.
 - Import the DHT library using import Adafruit_DHT
 - Read sensor data and display it on screen.

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CMR ENGINEERING COLLEGE

UGC AUTONOMOUS

(Approved by AICTE - New Delhi. Affiliated to JNTUH and Accredited by NAAC & NBA)



B. Tech I Year (Common to all Branches)

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ENGLISH LANGUAGE AND COMMUNICATION SKILLS (ELCS) LAB

COURSE CODE: EN107HS/ EN209HS

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

Listening Skills:

Objectives

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

Speaking Skills:

Objectives:

1. To improve their pronunciation and neutralize accent
2. To enable students express themselves fluently and appropriately
3. To practice speaking in social and professional contexts

Learning Outcomes

Students will be able to:

- CO-1:** Listen actively and identify important information in spoken texts
- CO-2:** Interpret the speech and infer the intention of the speaker
- CO-3:** Describe the Objects, Situations, Places, People and Events
- CO-4:** Develop speaking Skills with clarity and confidence
- CO-5:** Use the language in real life situations

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

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

The following course content is prescribed for the **English Language and Communication Skills Lab**.

Exercise – I

CALL Lab:

Instruction: Phonetics- Speech Sounds-Listening Skill - Importance – Purpose - Types- Barriers- Active Listening

Practice: Listening to Distinguish Speech Sounds- Minimal Pairs - *Testing Exercises*

ICS Lab:

Instruction: Spoken and Written language - Formal and Informal English - Greetings - Introducing Oneself and Others

Practice: Ice-Breaking Activity, Express Your View

Exercise – II

CALL Lab:

Instruction: Listening vs. Hearing- Syllables- Word Stress

Practice: Listening for General Information - *Listening Comprehension Exercises*

ICS Lab:

Instruction: Features of Good Conversation – Strategies for Effective Communication

Practice: Role Play Activity - Expressions used in Various Situations – 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 -Describing Objects, Situations, Places, People and Events

Exercise – IV

CALL Lab:

Instruction: Techniques for Effective Listening

Practice: *Listening for Specific Details* - *Listening Comprehension Exercises*

ICS Lab:

Instruction: How to Tell a Good Story - Story Star- Group Discussion

Practice: Telling and Retelling Stories, Group Discussion

Exercise – V

CALL Lab:

Instruction: Identifying the literal and implied meaning

Practice: Listening for Evaluation - *Listening Comprehension Exercises*

ICS Lab:

Instruction: Understanding Non-Verbal Communication

Practice: Silent Speech - Dumb Charades Activity

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
- ii) High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab:

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

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- 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.

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MS211HS: SOCIAL INNOVATION IN PRACTICE

B.Tech. I Year II Sem (Common to ECE, CSE, CSD, CSM)

L	T	P	C
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COURSE OBJECTIVES

1. Enable students to generate innovative ideas through brainstorming and case study analysis.
2. Familiarize students with essential hardware, software, and open-source tools for innovation and prototyping.
3. Provide a structured understanding of the design process using algorithms, flow diagrams, and modular approaches.
4. Guide students in developing functional solutions, deploying prototypes, and carrying out testing and validation.
5. Introduce commercialization strategies, business model development, and entrepreneurship concepts for sustainable innovation.

COURSE OUTCOMES

1. Students are able to apply brainstorming techniques to create ideas and assess their feasibility for real-world problems.
2. Students are able to use appropriate hardware/software tools to design prototype for their ideas.
3. Students are able to create structured designs using algorithms and flow diagrams.
4. Students are able to build prototypes and evaluate their performance.
5. Students are able to assess the business feasibility of their products and create a plan for commercialization, including marketing strategies.

Unit 1: Ideation & Feasibility: Ideation, Case studies, feasibility of innovative ideas, Formulation of practical and sustainable solutions.

Unit2: Design Process: Design algorithms and flow diagrams, Structured Module-wise design, Translating concepts into system-level designs.

Unit3: Tools and Techniques: Hardware and software tools for innovation, Open-source platforms for development, Digital prototyping and technical tools.

Unit 4: Idea Implementation: Develop functional solutions and prototypes, Deployment strategies and integration, Testing, validation and performance evaluation.

Unit 5: Commercialization Strategies & Entrepreneurship: Estimation of cost and resource requirements, Business development and planning, marketing strategies, Basics of entrepreneurship and startup development.

Renubha *A. Ramyanni* *V. N. S.* *K. S. P.* *J. Kalpana*

REFERENCES

1. Tim Brown, *Change by Design: How Design Thinking Creates New Alternatives for Business and Society*, Harper Business.
2. Vijay Kumar, *101 Design Methods: A Structured Approach for Driving Innovation in Your Organization*, Wiley.
3. Ash Maurya, *Running Lean: Iterate from Plan A to a Plan That Works*, O'Reilly Media.
4. Eric Ries, *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*, Crown Business.
5. Ulrich, Karl T., and Steven D. Eppinger, *Product Design and Development*, McGraw Hill.
6. *Social Entrepreneurship A practice based Approach to Social Innovation*. J.Howard Kucher & Stephenie E. Reible 2022.

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J. Kalpana
Renuka
A. Ramprasad
V. Ashwin
K. K. K. K.
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B. Swamy

II YEAR I SEMESTER (24 Hours)

S.No.	Course Code	Course Title	L	T	P	Credits
1.	EC301PC	Signals and Systems	3	1	0	4
2.	EC302PC	Probability Theory and Stochastic Processes	3	0	0	3
3.	EC303PC	Electronic Devices and Circuits	3	0	0	3
4.	EC304PC	Digital Logic Design	3	0	0	3
5.	EC305PC	Network Analysis and Synthesis	3	0	0	3
6.	EC306PC	Modelling and Simulation Lab	0	0	2	1
7.	EC307PC	Electronic Devices and Circuits Lab	0	0	2	1
8.	EC308PC	Digital Logic Design Lab	0	0	2	1
9.	EC309SD	Linux and Shell Scripting	0	0	2	1
		Total Credits	15	01	08	20

II YEAR II SEMESTER (26 Hours)

S. No.	Course Code	Course Title	L	T	P	Credits
1.	EC401PC	Electromagnetic Fields and Transmission Lines	3	1	0	4
2.	MA402BS	Numerical Methods and Complex Variables	3	1	0	4
3.	EC403PC	Analog and Digital Communications	3	0	0	3
4.	EC404PC	Electronic Circuit Analysis	3	0	0	3
5.	EC405PC	Linear and Digital IC Applications	3	0	0	3
6.	EC406PC	Analog and Digital Communications Lab	0	0	2	1
7.	EC407PC	Electronic Circuit Analysis Lab	0	0	2	1
8.	EC408PC	Linear and Digital IC Applications Lab	0	0	2	1
9.	EC409SD	Mobile Application Development	0	0	2	1
10.	VA411HS	Environmental Science	1	0	0	1
		Total Credits	16	02	08	22

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EC301PC: SIGNALS AND SYSTEMS**B.Tech. II Year I Sem.**

L	T	P	C
3	1	0	4

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.
3. Understand Laplace and Z-transforms their properties for analysis of signals and systems.
4. 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.

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.

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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 rise time. Extraction of Signal from Noise by Filtering.

UNIT - IV

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: 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,

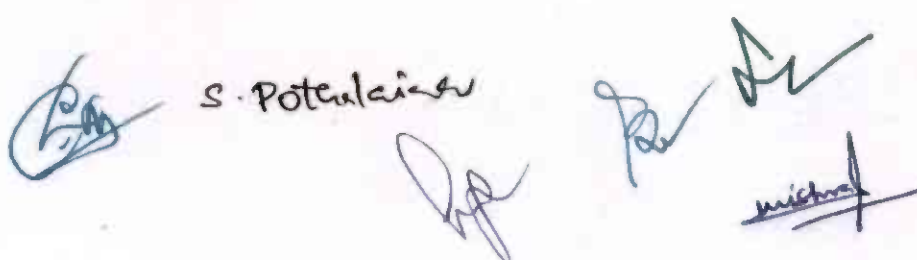
Z-Transforms: Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals. Inverse Z-transform. Properties of Z-transforms.

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.

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EC302PC: PROBABILITY THEORY AND STOCHASTIC PROCESSES**B.Tech. II Year I Sem**

L	T	P	C
3	0	0	3

Pre-requisite: Mathematics**Course Objectives:**

1. This gives basic understanding of random variables and operations that can be performed on them.
2. To know 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.
4. Understand the concepts of Noise and Information theory in Communication systems.

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**

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.

UNIT - III

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).

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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: 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: 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.

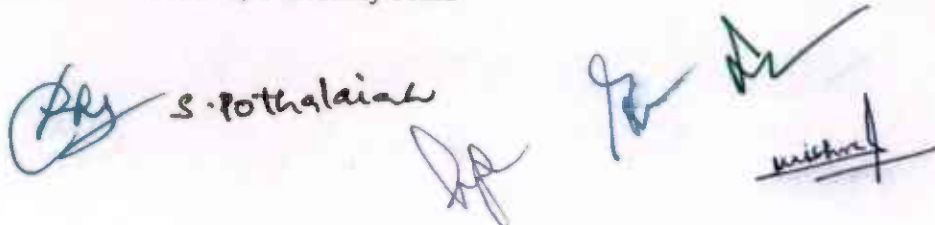
Noise sources: Resistive / Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties.

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

REFERENCES:

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

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EC303PC: ELECTRONIC DEVICES AND CIRCUITS**B.Tech. II Year I Sem.**

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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 and amplifier design. 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.

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, Full-wave (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



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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 and Thyristors: Tunnel Diode, Varactor Diode, Photo Diode, Solar Cell, LED and Schottky Diode, SCR, DIAC, TRIAC.

Field Effect Transistors and Biasing: JFET: Structure, operation, and characteristics, MOSFET: Enhancement and Depletion modes – Structure, operation, and characteristics, FET Biasing: Fixed Bias, Self Bias.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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EC304PC: DIGITAL LOGIC DESIGN**B.Tech. II Year I Sem**

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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.

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.

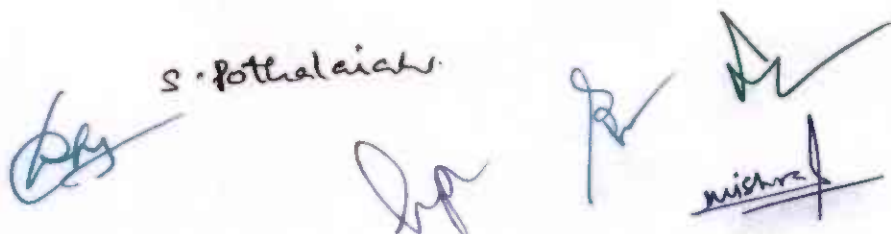
UNIT - III:

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.

S. Pothalaiah



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.

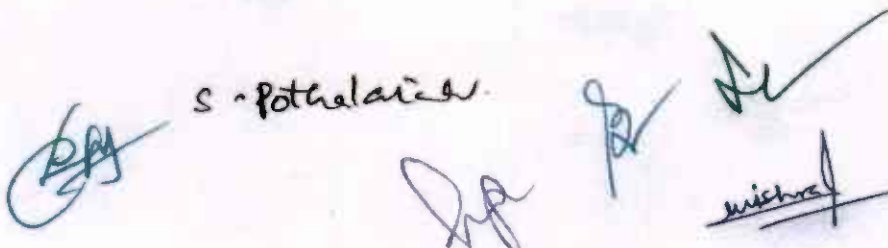
Programmable Logic Devices: Memory devices - RAM, ROM, Programmable Logic Arrays (PLA), and Programmable Array Logic (PAL).

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.

The bottom of the page contains several handwritten signatures and initials in blue ink. From left to right, there is a circular signature, the name 'S. Potthelainen', a stylized signature, a checkmark, and a signature that appears to be 'Michael'.

EC305PC: NETWORK ANALYSIS AND SYNTHESIS**B.Tech. II Year I Sem**

L	T	P	C
3	0	0	3

Course Objectives:

1. To understand the basic concepts on RLC circuits.
2. To know the behavior 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 behavior.
2. Analyze the Steady state and transient analysis of RLC Circuits.
3. Characterization of two port network parameters.
4. Analyze the Design aspect of various filters and attenuators

UNIT - I

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

UNIT - II

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

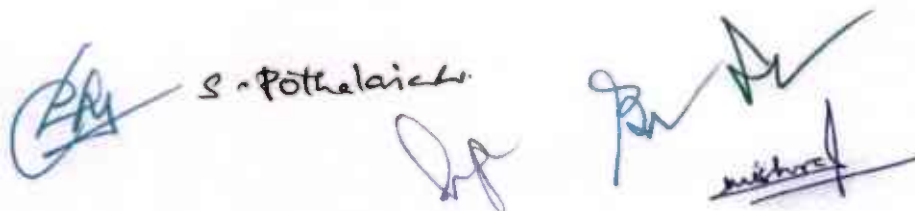
UNIT - III

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

UNIT-IV

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

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

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UNIT – V

Network Synthesis: Driving point impedance and admittance, transfer impedance and admittance, network functions of Ladder and non ladder networks, Poles, Zeros analysis of network functions,

Hurwitz polynomials, Positive Real Functions, synthesis of LC, RC and RL Functions by foster and causer methods.

TEXT BOOKS:

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

REFERENCE BOOKS:

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



S. Pothalaiah



EC306PC: MODELLING & SIMULATION LAB**B.Tech. II Year I Sem**

L	T	P	C
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Note:

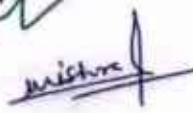
- All the experiments are to be simulated using MATLAB or equivalent software
- Minimum of 12 experiments are to be completed / simulated.
- Will be able to use a simulation tool for generating, analyzing and performing various operations on Signals / Sequences both in time and Frequency domain.
- Will 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.

List of Experiments:**Signals and Systems**

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.


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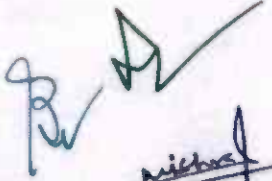
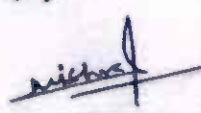


8. Write the code/ script for finding and plotting the Magnitude and Phase Spectrum of any given Sequence by finding its Z-Transform by using the properties wherever required. Also plot pole – zero diagram in Z-plane.
9. Design a Simulink or equivalent model for
 - a) Solving Differential Equations
 - b) Finding the response of any RLC Circuit with different initial Conditions for AC and DC inputs and plot the corresponding responses
10. Gibbs Phenomenon and waveform synthesis.

Probability Theory and Stochastic Processes

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.

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EC307PC: ELECTRONIC DEVICES AND CIRCUITS LAB**B.Tech. II Year I Sem**

L	T	P	C
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Course Overview:

This lab 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.

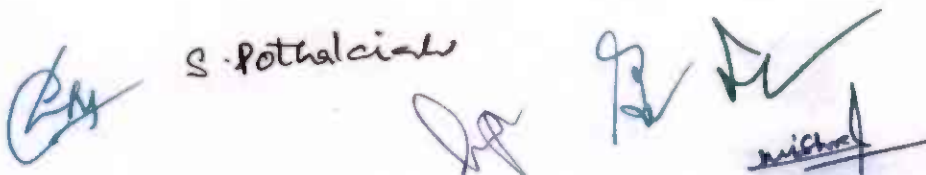
CO3: Demonstrate biasing techniques for BJTs and determine their operating point using DC load line analysis.

CO4: Design and analyze transistor amplifier circuits in various configurations using h-parameter models.

CO5: Simulate and interpret electronic circuits using appropriate simulation tools.

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.

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B. Software-Based Simulation Experiments (7):

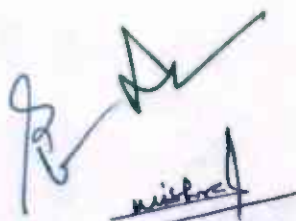
1. Simulate a full-wave bridge rectifier with capacitor filter to analyze waveform smoothing and ripple reduction in DC power supply design.
2. Simulate a Zener diode-based voltage regulator to study voltage stabilization against varying supply voltages and load resistances.
3. Simulate a common emitter 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

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EC308PC: DIGITAL LOGIC DESIGN LAB**B.Tech. II Year I Sem.**

L	T	P	C
0	0	2	1

Course Overview

This LAB 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 test benches.

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

List of Experiments**A. Realization in Hardware LAB (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 a 4-bit synchronous up/down counter using D or JK flip flop.
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.

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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

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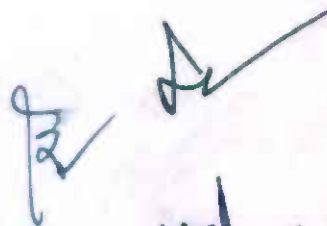
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Required Software Tools (for Verilog HDL Experiments) (Any one of the tool below)

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

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EC309SD: LINUX AND SHELL SCRIPTING**B.Tech. II Year I Sem.****Prerequisites**

L	T	P	C
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- Basic Understanding of Operating Systems:
- Command-Line Interface (CLI) Familiarity:
- Basic Programming Concepts:

Course Objectives:

- To write shell script programs to solve problems.
- To implement some standard Linux utilities such as ls, cp etc using system calls.
- To develop network based applications.

Course Outcomes:

- Understand basics of Linux Operating System and File System.
- Understanding the basic set of commands and utilities in Linux systems.
- Write shell programming and investigate & manage processes.

Lab Problems:

1. To Install Ubuntu Linux and LINUX Commands (File Handling utilities, Text processing utilities, Network utilities, Disk utilities, Backup utilities and Filters)
2. Write a Shell Script that accepts a file name, starting and ending line numbers as arguments and displays all lines between the given line numbers.
3. Write a shell script that deletes all lines containing the specified word in one or more files supplied as arguments to it.
4. Write a shell script that displays a list of all files in the current directory to which the user has read, write and execute permissions.
5. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or directory and reports accordingly. whenever the argument is a file it reports no of lines present in it
6. Write a shell script that accepts a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
7. Write a shell script to list all of the directory files in a directory
8. Write a shell script to find factorial of a given number.
9. Write an awk script to count number of lines in a file that does not contain vowels
10. Write an awk script to find the no of characters, words and lines in a file

Reference books:

1. Learning the bash Shell, 3rd Edition by Cameron Newham, Publisher(s): O'Reilly Media, Inc., ISBN: 9780596009656.
2. Shell Scripting: Expert Recipes for Linux, Bash, and More by Steve Parker.
3. Linux System Programming, Robert Love, O'Reilly, SPD, rp-2007.

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EC401PC: ELECTROMAGNETIC FIELDS AND TRANSMISSION LINES**B.Tech. II Year II Sem.**

L	T	P	C
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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.

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

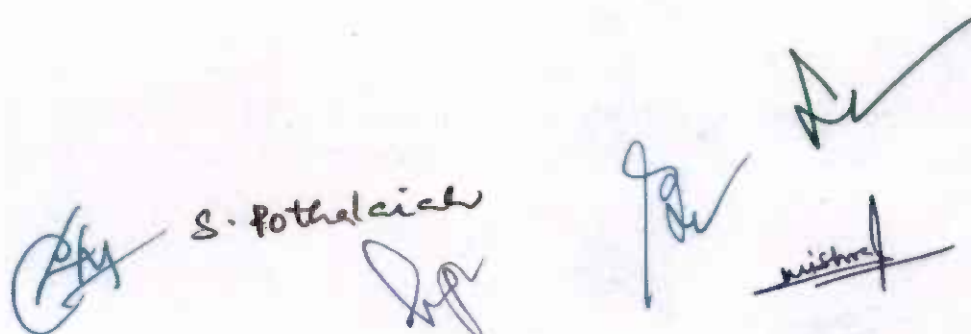
Types, Parameters, Equivalent Circuit, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless Lines, Types of Distortions, condition for Distortion less transmission lines, 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, 8th Ed., McGrawHill, 2014
2. Principles of Electromagnetics –Matthew N.O. Sadiku and S.V. Kulkarni, 6th Ed., Oxford University Press, Asian Edition, 2015.

REFERENCES:

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

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EC403PC: ANALOG AND DIGITAL COMMUNICATIONS**B.Tech. II Year II Sem.**

L	T	P	C
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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.

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.

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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 Schilling, 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

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EC404PC: ELECTRONIC CIRCUIT ANALYSIS**B.Tech. II Year II Sem.**

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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.

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

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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.

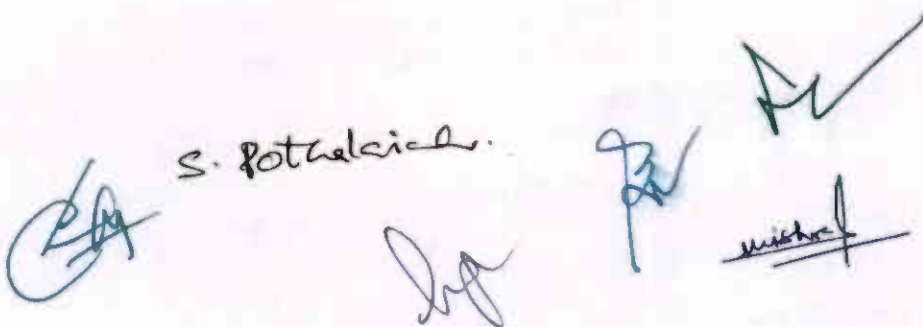
Time Base Generators: General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators, Linearity improvement techniques

TEXT BOOKS:

1. Millman, Jacob, and Christos C. Halkias. *Electronic Devices and Circuits*. McGraw-Hill Education, 2008.
2. Bell, David A. *Electronic Devices and Circuits*. Oxford University Press, 2008.
3. Sedra, Adel S., and Kenneth C. Smith. *Microelectronic Circuits*. 7th ed., Oxford University Press, 2015.

REFERENCE BOOKS:

1. Boylestad, Robert L., and Louis Nashelsky. *Electronic Devices and Circuit Theory*. 11th ed., Pearson Education, 2013.
2. Millman, Jacob, and Arvin Grabel. *Microelectronics*. 2nd ed., McGraw-Hill, 1987.
3. Malvino, Albert Paul. *Electronic Principles*. 7th ed., McGraw-Hill Education, 2007.
4. Millman, Jacob, and Herbert Taub. *Pulse, Digital, and Switching Waveforms*. McGraw-Hill Education, 1991.

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EC405PC: LINEAR AND DIGITAL IC APPLICATIONS**B.Tech. II Year II Sem.**

L	T	P	C
3	0	0	3

Pre-requisite: Switching Theory and Logic Design.**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 IC555 and IC565.
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**

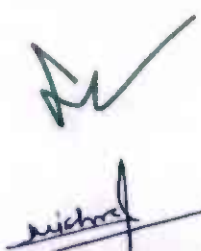
Ideal and Practical Op-Amp Characteristics, Features of 741 Op- Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three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

UNIT - II**Op-Amp, IC-555 & IC565 Applications**

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**

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder 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.

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UNIT - IV**Combinational Logic ICs**

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**

Familiarity with commonly available 74XX & CMOS 40XX Series ICs- All Types of Flip flops, Synchronous Counters, Decade Counters, Shift Registers.

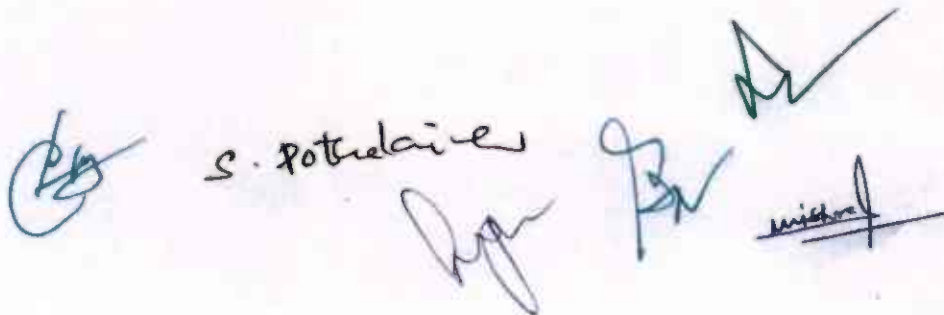
Memories - ROM Architecture, Types of ROMs & Applications, RAM Architecture, Static & Dynamic RAMs.

TEXT BOOKS

1. Op-Amps & Linear ICs- Ramakanth A. Gayakwad, PHI, 2003.
2. Digital Fundamentals -Floyd and Jain, Pearson Education, 8th Ed., 2005.

REFERENCE BOOKS

1. Linear Integrated Circuits -D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
2. Digital Design Principles and Practices-John. F. Wakerly, Pearson 3rd Ed., 2009.
3. Linear Integrated Circuits and Applications - Salivahana, TMH, 2008.
4. Operational Amplifiers with Linear Integrated Circuits, 4th Ed., William D. Stanley, Pearson Education India, 2009.

The bottom of the page features several handwritten signatures and initials in blue ink. From left to right, there is a circular signature, the name 'S. Potlur', a signature that appears to be 'Raj', a signature that appears to be 'Bh', and a signature that appears to be 'Mishra'.

EC406PC: ANALOG AND DIGITAL COMMUNICATIONS LAB**B.Tech. II Year II Sem.**

L	T	P	C
0	0	2	1

Course Outcomes:

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 waveforms of these modulated Signals practically.

Note:

- Minimum 12 experiments should be conducted.
- All these experiments are to be simulated first 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. Design and implement a Pulse Amplitude Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations.

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7. Design and implement a Pulse Width Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations.
8. Design and implement a Pulse Position Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations.
9. Generate PCM Modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
10. Generate Delta Modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
11. Generate FSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
12. Generate practically Binary PSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
13. Generate practically DPSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
14. Generate practically QPSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
15. Plot Signal Constellation for BPSK, BFSK and QPSK.
16. Analyze the performance of BPSK, BFSK and QPSK under noisy environment through constellation diagram.
17. Demonstrate ISI through eye diagram.
18. Simulate raised cosine signal and duo binary signals.
19. Encode data using Shannon Fano / Huffman Coding through Hardware / Simulator
20. Analyze the performance of a Matched filter.



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EC407PC: ELECTRONIC CIRCUIT ANALYSIS LAB**B.Tech. II Year II Sem.**

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Course Overview:

The Electronic Circuit Analysis LAB 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.

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 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.



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B. Software Simulations (6):

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.

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 ($\pm 15\text{V}$, 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.)



S. Pothalaise



EC408PC: LINEAR AND DIGITAL IC APPLICATIONS LAB**B.Tech. II Year II Sem.**

L	T	P	C
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Course Outcomes:

- 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.

Note:

- Minimum 12 experiments 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 Voltage Regulator using IC723, IC 7805 / 7809 / 7912 and find its load regulation factor.
11. Design a Gray code converter and verify its truth table.
12. Design a 8x1 multiplexer using digital ICs.
13. Design a Decade counter and verify its truth table and draw respective waveforms.
14. Design a Up/down counter using IC74163 and draw read/write waveforms.
15. Design a Universal shift register using IC74194 / 195 and verify its shifting operation.
16. Design a 16x4 RAM using 74189 and draw its read /write operation.
17. Design a 8x3 encoder / 3x8 decoder and verify its truth table.

S. Sathish

EC409SD: MOBILE APPLICATION DEVELOPMENT**B.Tech II Year II-Sem**

L	T	P	C
0	0	2	1

Prerequisites: --- NIL---**Course Objectives:**

1. To learn how to develop Applications in android environment.
2. To learn how to develop user interface applications.

Course Outcomes:

1. Student understands the working of Android OS Practically.
2. Student will be able to develop user interfaces.
3. Student will be able to develop, deploy and maintain the Android Applications.

List of Experiments**ANDROID STUDIO**

1. **Android Operating System:** Android OS and Features – Android development framework; Installing and running applications on Android Studio, Creating AVDs.
2. **Android application components:** Android Manifest file, Externalizing resources like Simple Values, Drawables, Layouts, Menus, etc.
3. **Building User Interfaces:** Fundamental Android UI design, Layouts – Linear, Relative, Grid and Table Layouts. User Interface (UI) Components.

PROGRAMS

1. Create an Android application that shows Hello + name of the user and run it on an emulator.
2. Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
3. Create a screen that has input boxes for User Name, Password, and Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. (Use any Layout).
4. Create an alarm that rings every Sunday at 8:00 AM. Modify it to use a time picker to set alarm time.



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