ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

ELECTRONICS AND COMMUNICATION ENGINEERING

For

B.TECH FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2022-2023)

MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

Established: 2009 **EAMCET Code: MLRS**

Academic Regulations, Course Structure and Detailed Syllabus under Autonomous Status

Bachelor of Technology (B.Tech)

B.Tech - Regular Four Year Degree Programme
(For admitted batches from the academic year 2022 - 2023)
&
B.Tech - Lateral Entry Scheme
(For admitted batches from the academic year 2023 - 2024)

MLRS – R22 Regulations

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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.

Academic Autonomy: Means freedom to an institute in all aspects of conducting its academic Programmes, 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 one supplementary semester.

Branch: Means specialization in a Programme like B.Tech degree Programme in Aeronautical Engineering, B.Tech degree Programme 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 Programmes 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.

Certificate Course: It is a course that makes a student to have hands-on expertise and skills required for holistic development in a specific area/field.

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

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 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 Programme 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 doesn‘t 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 Marri Laxman Reddy Institute of Technology and management, 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 Programme will lead to a degree with specialization.

Programme: Means, UG degree Programme: Bachelor of Technology (B.Tech); PG degree Programme: Master of Technology (M. Tech) / Master of Business Administration (MBA).

Programme 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 Programme.

Regulations: The regulations, common to all B.Tech Programmes offered by Institute, are designated as - MLRS Regulations – R22 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 Programme 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 (deadlines are different for summer sessions). 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 Marri Laxman Reddy Institute of Technology and management (MLRITM), 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 J N T 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.

MLRITM 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.

PRINCIPAL

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous)

ACADEMIC REGULATIONS (MLRS- R22) FOR B.TECH. REGULAR STUDENTS

WITH EFFECT FROM THE ACADEMIC YEAR 2022 – 23

For pursuing four year under graduate Bachelor Degree Programme of study in Engineering (B.Tech) offered by Marri Laxman Reddy Institute of Technology and management under Autonomous status is here in referred to as MLRS (UGC Autonomous).

All the rules specified here in approved by the Academic Council will be in force and applicable to students admitted from the Academic Year 2022-23 onwards. Any reference to "Institute" or "College" in these rules and regulations shall stand for Marri Laxman Reddy Institute of Technology and Management (UGC Autonomous).

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

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

Marri Laxman Reddy Institute of Technology and Management offers a 4-year (8 semesters) **Bachelor of Technology** (B.Tech.) degree programme, under Choice BasedCredit System (CBCS) with effect from the academic year **2022-23.**

2.0 Eligibility for Admission

2.1 Admission to the undergraduate (UG) programme shall be made either on the basis of the merit rank obtained by the qualified student in entrance test conducted by the Telangana State Government (EAMCET) or the University or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the government from time to time.

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

3.0 B.Tech. Programme Structure

3.1 A student after securing admission shall complete the B.Tech. programme in a minimumperiod of four academic years (8 semesters), and a maximum period of eight academic years (16 semesters) starting from the date of commencement of first year first semester, failing which student shall forfeit seat in B.Tech course. Each student shall secure 160 credits (with CGPA $\geq$ 5) required for the 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, which are listed below**.**

3.2.1 Semester Scheme

Each undergraduate programme is of 4 academic years (8 semesters) with the academic year divided into two semesters of 22 weeks (≥ 90 instructional days) each and in each semester - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)' under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) indicated by UGC, and curriculum / course structure suggested by AICTE are followed.

3.2.2 Credit Courses

All subjects/ courses are to be registered by the student in a semester to earn credits whichshall be assigned to each subject/ course in an L: T: P: C (lecture periods: tutorial periods:practical periods: credits) structure based on the following general pattern.

- One credit for one hour / week / semester for Theory / Lecture (L) courses or Tutorials.
- One credit for two hours / week / semester for Laboratory / Practical (P) courses.

Courses like Environmental Science, Constitution of India, Intellectual Property Rights and Gender Sensitization Lab are mandatory courses. These courses will not carry any credits.

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. The University has followed almost all the guidelines issued by AICTE / UGC.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BS – Basic Sciences	Includes Mathematics, Physics and Chemistry subjects
2		ES - Engineering Sciences	Includes Fundamental Engineering Subjects
3		HS – Humanities and Social Sciences	Includes subjects related to Humanities, Social Sciences and Management
4	Core Courses (CoC)	PC – Professional Core	Includes core subjects related to the parent Discipline / department / branch of Engineering / Branch Specific Courses / Skill Development Courses
5	Elective Courses (EℓC)	PE – Professional Electives	Includes elective subjects related to the parent Discipline / department / branch of Engineering.
6		OE – Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline / department / branch of Engineering.
7	Core Courses	Project Work	B.Tech. Project or UG Project or UG Major Project or Project Stage I & II
8		Industry Training / Internship / Industry Oriented Mini-project / Mini- Project / Skill Development Courses	Industry Training / Internship / Industry Oriented Mini-Project / Mini-Project / Skill Development Courses

9		Seminar	Seminar / Colloquium based on core contents related to parent discipline / department / branch of Engineering.
10	Minor Courses	-	1 or 2 Credit Courses (subset of HS)
11	Mandatory Courses (MC)	-	Mandatory Courses (non-credit)

4.0 Course Registration

4.1 A 'faculty advisor or counselor' shall be assigned to a group of 20 students, who will advise the students about the undergraduate programme, its course structure and curriculum, choice / option for subjects / courses, based on their competence, progress, pre-requisites and interest.

4.2 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 on-line registration requests for any 'current semester' shall be **completed before the commencement of SEEs (Semester End Examinations) of the 'preceding semester'**.

4.3 A student can apply for **on-line** registration, **only after** obtaining the '**written approval**' from faculty advisor / counselor, 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 / Counselor and the student.

4.4 A student may be permitted to register for all the subjects / courses in a semester as specified in the course structure with maximum additional subject(s) / course(s) limited to 6 Credits (any 2 elective subjects), based on **progress** and SGPA / CGPA, and completion of the '**pre-requisites'** as indicated for various subjects / courses, in the department course structure and syllabus contents.

4.5 Choice for '**additional subjects / courses**', not more than any 2 elective subjects in any Semester, must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor / Mentor / HOD.

4.6 If the student submits ambiguous choices or multiple options or erroneous entries during **on-line** registration for the subject(s) / course(s) under a given / specified course group / category as listed in the course structure, only the first mentioned subject / course in that category will be taken into consideration.

4.7 Subject / course options exercised through **on-line** registration are final and **cannot** be changed or inter-changed; further, alternate choices also will not be considered. However, if the subject / 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 subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within **a week** after the commencement of class-work for that semester.

4.8 Dropping of subjects / courses may be permitted, only after obtaining prior approval from the faculty advisor / counselor 'within a period of 15 days' from the beginning of the current semester.

4.9 **Open Electives**: The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt foran Open Elective subject offered by his own (parent) department, if the student has notregistered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat / should not match with any category (Professional Core, Professional Electives, Mandatory Courses etc.) of subjects even in the forthcoming semesters.

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

5.0 Subjects / courses to be offered

5.1 A subject / course may be offered to the students, **only if** a minimum of 15 students opt for it.

5.2 More than **one faculty member** may offer the **same subject** (lab / practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection of choice for students will be based on - '**first come first serve** basis and CGPA criterion' (i.e. the first focus shall be on early **on-line entry** from the studentfor registration in that semester, and the second focus, if needed, will be on CGPA of thestudent).

5.3 If more entries for registration of a subject come into picture, then the Head of the Department concerned shall decide, whether or not to offer such a subject / course for **two (or multiple) sections**.

5.4 In case of options coming from students of other departments / branches / disciplines (not considering **open electives**), first **priority** shall be given to the student of the '**parent department**'.

6.0 Attendance requirements:

6.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum of 75% of attendance in aggregate of all the subjects / courses (including attendance in mandatory courses like Environmental Science, Constitution of India, Intellectual Property Rights and Gender Sensitization Lab) for that semester. **Two periods** of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject.

6.2 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.

6.3 A stipulated fee shall be payable for condoning of shortage of attendance.

6.4 Shortage of attendance below 65% in aggregate shall in **NO** case be condoned.

6.5 **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 their registration for that semester shall stand cancelled,** including all academic credentials(internal marks etc.) of that semester**. They will not be promoted to the next semester.**They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and / or

open electives, the same may also be re- registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

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

7.0 Academic Requirements

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in Item No. **6**.

7.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject / course, if student secures not less than 35% (14 marks out of 40 marks including minimum 35% of average Mid-Term examinations for 25 marks) in the internal examinations, not less than 35% (21 marks out of 60 marks) in the semester end examination, 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.

7.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship (or) Seminar, 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 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 Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship evaluations.

A student may reappear once for each of the above evaluations, when they are scheduled again; if the student fails in such 'one reappearance' evaluation also, the student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.3 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.**
2	**First year second semester to Second year first semester**	**(i) Regular course of study of first year second semester.** **(ii) Must have secured at least 20 credits out of 40 credits i.e., 50% 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.**

4	**Second year second semester to Third year first semester**	**(i) Regular course of study of second year second semester.** **(ii) Must have secured at least 48 credits out of 80 credits i.e., 60% 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.**
6	**Third year second semester to Fourth year first semester**	**(i) Regular course of study of third year second semester.** **(ii) Must have secured at least 72 credits out of 120 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.**
7	**Fourth year first semester to Fourth year second semester**	**Regular course of study of fourth year first semester.**

7.4 A student (i) shall register for all courses / subjects covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA $\geq$ 5.0 (in each semester), andCGPA $\geq$ 5 (at the end of 8 semesters), (iv) **passes all the mandatory courses,** to successfully complete the undergraduate programme. The performance of the student in these 160 credits shall be considered for the calculation of the final CGPA **(at the end of undergraduate programme),** and shall be indicated in the grade card / marks memo of IV-year II semester.

7.5 If a student registers for '**extra subjects'** (in the parent department or other departments / branches of Engg.) other than those listed subjects totaling to 160 credits as specified in the course structure of his department, the performances in those '**extra subjects**' (although evaluated and graded using the same procedure as that of the required 160 credits) will not be considered while calculating the SGPA and CGPA. For such '**extra subjects'** registered, percentage of marks and letter grade alone will beindicated in the grade card / marks memo as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations Items6 and 7.1 – 7.4 above.

7.6 A student eligible to appear in the semester end examination for any subject / course, but absent from it or failed (there by failing to secure **'C'** grade or above) may reappear for that subject / course in the supplementary examination as and when conducted. In such cases, internal marks (CIE) assessed earlier for that subject / course will be carriedover, and added to the marks to be obtained in the SEE supplementary examination forevaluating performance in that subject.

7.7 A student **detained in a semester due to shortage of attendance may be re-admitted in the same semester in the next academic year for fulfillment of academic requirements**. The academic regulations under which a student has been re-admitted shall be applicable. Further, no grade allotments or SGPA / CGPA calculations will be done for the entire semester in which the student has been detained.

7.8 A student detained **due to lack of credits, shall be promoted to the next academic year only after acquiring the required number of academic credits.** The academic regulations under which the student has been readmitted shall be applicable to him.

8.0 Evaluation - Distribution and Weightage of Marks

8.1 The performance of a student in every subject / course (including practicals and Project Stage – I & II) will be evaluated for 100 marks each, with 40 marks allotted for CIE (Continuous Internal Evaluation) and 60 marks for SEE (Semester End-Examination).

8.2 In CIE, for theory subjects, 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 with a total duration of 2 hours as follows:

1. Mid Term Examination for 30 marks:

a. Part - A : Objective / quiz / short answer type paper for 10 marks.

b. Part - B : Descriptive paper for 20 marks.

The objective / quiz / short answer type paper is set with one sentence answered questions, multiple choice, fill-in the blanks and match the following type of questions for a total of 10 marks. The descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks. The average of two midterm examinations shall be taken as the final marks for mid term examinations.

The remaining 10 marks of Continuous Internal Assessment (out of 40) are distributed as:

2. Assignment for 5 marks. (Average of 2 Assignments each for 5 marks)
3. Subject Viva-Voce / PPT / Poster Presentation / Case Study on a topic in the concerned subject for 5 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.

Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). 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. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

Subject Viva-Voce / PPT / Poster Presentation / Case Study on a topic in the subject concerned for 5 marks before II Mid-Term Examination.

- The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks (14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

There is NO Computer Based Test (CBT) for R22 regulations.

The details of the end semester question paper pattern are as follows:

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

- Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
- Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from each unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.
- The duration of Semester End Examination is 3 hours.

8.3 For practical subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination. Out of the 40 marks for internal evaluation:

1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks
2. **10 marks for viva-voce (**or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.
4. The remaining 10 marks are for Laboratory Project, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) PrototypePresentation 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 teacher. The external examiner shall be appointed from the cluster / other colleges which will be decided by the examination branch of the University.

In the Semester End Examination held for 3 hours, total 60 marks are divided and allocated as shown 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.

- The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Overall 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

The student is eligible to write Semester End Examination of the concerned subject, if the student scores ≥ 35% (14 marks) of 40 Continuous Internal Examination (CIE) marks.

In case, the student appears for Semester End Examination (SEE) of the concerned subject but not scored minimum 35% of CIE marks(14 marks out of 40 internal marks), his performance in that subject in SEE shall stand cancelled inspite of appearing the SEE.

8.3.1 <u>Engineering Graphics:</u>

- For the subjects having Design and / or Drawing, (such as Engineering Graphics, Engineering Drawing Practice, Machine Drawing Practice, Production Drawing Practice, and Estimation), the distribution shall 40 marks for CIE 30 marks for day-to-day work and timely submission of drawing sheets and 10 marks for internal tests). There shall be two internal tests in a semester and the average of the two shall be considered for the award of marks for CIE.
- The distribution of marks for SEE shall be 60 marks. The SEE shall consist of five questions carrying 12 marks each. Each of these questions is from one unit and may contain sub questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

8.4 The evaluation of courses having ONLY internal marks in I Year I semester and II Year II Semester is as follows:

1. I Year I Semester course (*ex., Elements of CE/ME/EEE/ECE/CSE*): The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.
2. II Year II Semester *Real-Time (or) Field-based Research Project* course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e. 20 marksout of 50 marks from average of the two examinations. There shall be NO external evaluation. 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 (ii) secures less than 40% marks in this course.

8.5 There shall be an Industry training (or) Internship (or) Industry oriented Mini-project (or) Skill Development Courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project in collaboration with an industry of their specialization. Students shall register for this immediately after II-Year II Semester Examinations and pursue it during summer vacation / semester break & during III Year without effecting regular course work. Internship at reputed organization (or) Skill development courses (or) Paper presentation in reputed journal (or) Industry Oriented Mini Project shall be submitted in a report form and presented before the committee in III-year II 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 (or) Internship etc, Internal Supervisor and a Senior Faculty Member of the Department. There shall be NO internal marks for Industry Training (or) Internship (or) Mini-Project (or) Skill Development Courses (or) Paper Presentation in reputed journal (or) Industry Oriented Mini Project.

8.6 The UG project shall be initiated at the end of the IV Year I Semester and the duration of the project work is one semester. The student must present Project Stage – I during IV Year I Semester before II Mid examinations, in consultation with his Supervisor, the title, objective and plan of action of his Project work to the departmental committee for approval before commencement of IV Year II Semester. Only after obtaining the approval of the departmental committee, the student can start his project work

8.7 UG project work shall be carried out in two stages: Project Stage – I for approval of project before Mid-II examinations in IV Year I Semester and Project Stage – II during IV Year II Semester. Student has to submit project work report at the end of IV Year II Semester. The project shall be evaluated for 100 marks before commencement of SEE Theory examinations.

8.8 For Project Stage – I, the departmental committee consisting of Head of the Department, project supervisor and a senior faculty member shall approve the project work to begin before II Mid-Term examination of IV Year I Semester. The student is deemed to be not eligible to register for the Project work, if he does not submit a reporton Project Stage - I or does not make a presentation of the same before the evaluation committee as per schedule.

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

8.9 For Project Stage – II, the external examiner shall evaluate the project work for 60 marks and the internal project committee shall evaluate it for 40 marks. Out of 40 internal marks, the departmental committee consisting of Head of the Department, Project Supervisor and a Senior Faculty Member shall evaluate the project work for 20 marks and Project Supervisor shall evaluate for 20 marks. The topics for Industry Oriented Mini Project / Internship / SDC etc. and the main Project shall be different fromthe topic already taken. 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 totalof the CIE and SEE taken together.

For conducting viva-voce of project, College selects an external examiner from the list of experts in the relevant branch submitted by the Head of the Department.

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

8.10 A student shall be given one time chance to re-register for a maximum of two subjects:

- If the internal marks secured by a candidate in Continuous Internal Evaluation marks for 40 (average of two mid-term examinations consisting of Objective & descriptive parts, average of two assignments & Subject Viva-Voce / PPT / Poster Presentation / Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects

A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the class work in next academic year.
In the event of the student taking this chance, his Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

9.0 Grading Procedure

9.1 Grades will be awarded to indicate the performance of students in each Theory Subject, Laboratory / Practical's / Industry-Oriented Mini Project / Internship / SDC and Project Stage. 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.

9.2 As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC / AICTE guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a Subject / Course (Class Intervals)	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

9.3 A student who has obtained an '**F'** grade in any subject shall be deemed to have '**failed'** and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

9.4 To a student who has not appeared for an examination in any subject, '**Ab'** grade will be allocated in that subject, and he is deemed to have '**Failed'**. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.

9.5 A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

9.6 A student earns Grade Point (GP) in each subject / course, on the basis of the letter gradesecured in that subject / course. The corresponding 'Credit Points' (CP) are computed by multiplying the grade point with credits for that particular subject / course.

Credit Points (CP) = Grade Point (GP) x Credits …. For a course

9.7 A student passes the subject / course only when **GP ≥ 5 ('C' grade or above)**

9.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (ΣCP) secured from all subjects / courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to **two** decimal places. SGPA is thus computed as

$$\textbf{SGPA} = \{ \sum_{i=1}^{N} C_i G_i \} / \{ \sum_{i=1}^{N} C_i \} \text{ …. For each semester},$$

where 'i' is the subject indicator index (considering all subjects in a semester), 'N' is the no. of subjects '**registered'** for the semester (as specifically required and listed under the course structure of the parent department), C_i is the no. of credits allotted to the i^{th} subject, and G_i represents the grade points (GP) corresponding to the letter gradeawarded for that i^{th} subject.

9.9 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 in **all** registered courses (of 160) 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 from the I year II semester onwards at the end of each semester as per the formula.

$$\textbf{CGPA} = \{ \sum_{j=1}^{M} C_j G_j \} / \{ \sum^{M} C_j \} \text{ … for all S semesters registered}$$

(i.e., up to and inclusive of S semesters, S ≥ 2),

where '**M'** is the **total** no. of subjects (as specifically required and listed under the course structure of the parent department) the student has '**registered'** i.e., from the 1st semester onwards up to and inclusive of the 8th semester, 'j' is the subject indicator index (takes into account all subjects from 1 to 8 semesters), C_j is the no. of credits allotted to the j^{th} subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of I year I semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course / Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	4	C	5	4 x 5 = 20
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	C	5	3 x 5 = 15
	21			152

SGPA = 152/21 = 7.24

Illustration of Calculation of CGPA up to 3rd Semester:

Semester	Course / Subject Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	Credit Points (CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24
II	Course 8	4	A	8	32
II	Course 9	3	C	5	15
II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
	Total Credits	69		Total Credit Points	518

CGPA = 518/69 = 7.51

The calculation process of CGPA illustrated above will be followed for each subsequent semester until 8th semester. The CGPA obtained at the end of 8th semester will become the final CGPA secured for entire B.Tech. programme.

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

9.11 SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester. However, mandatory courses will not be taken into consideration.

10.0 Passing Standards

10.1 A student shall be declared successful or 'passed' in a semester, if he secures a GP ≥ 5(**'C'** grade or above) in every subject / course in that semester (i.e. when the student gets an SGPA ≥ 5.0 at the end of that particular semester); and he shall be declared successful or 'passed' in the entire undergraduate programme, only when gets a CGPA ≥ 5.00 (**'C'** grade or above) for the award of the degree as required.

10.2 After the completion of each semester, a grade card or grade sheet shall be issued to allthe registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, grade earned, etc.) and credits earned. **There is NO exemption of credits in any case.**

11.0 Declaration of results

11.1 Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.

11.2 For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

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

12.0 Award of Degree

12.1 A student who registers for all the specified subjects / courses as listed in the course structure and secures the required number of 160 credits (with CGPA ≥ 5.0), 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.

12.2 A student who qualifies for the award of the degree as listed in item 12.1 shall be placedin the following classes.

12.3 A student with final CGPA (at the end of the undergraduate programme) ≥ 8.00, and fulfilling the following conditions - shall be placed in '**First Class with Distinction'**.

However, he

(i) Should have passed all the subjects/courses in '**First Appearance'** within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.

(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 ≥ 8 shall beplaced in **'First Class'**.

12.4 Students with final CGPA (at the end of the undergraduate programme) ≥ 7.0 but < 8.00 shall be placed in **'First Class'**.

12.5 Students with final CGPA (at the end of the undergraduate programme) ≥ 6.00 but < 7.00, shall be placed in '**Second Class'**.

12.6 All other students who qualify for the award of the degree (as per item 12.1), with finalCGPA (at the end of the undergraduate programme) ≥ 5.00 but < 6, shall be placed in '**pass class**'.

12.7 A student with final CGPA (at the end of the undergraduate programme) < 5.00 will not be eligible for the award of the degree.

12.8 Students fulfilling the conditions listed under item 12.3 alone will be eligible for awardof '**Gold Medal**'.

12.9 Award of 2-Year B.Tech. Diploma Certificate

1. A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) upto B.Tech. II Year II Semester, if the student want to exit the 4-Year B.Tech. program and requests for the 2 -Year B. Tech. (UG) Diploma Certificate.

2. The student **once opted and awarded 2-Year UG Diploma Certificate, the student will be permitted to join** in B. Tech. III Year I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree ONLY in the next academic year along with next batch students. However, if any student wishes to continue the study after opting for exit, he/she should register for the subjects/courses in III Year I Semester before commencement of class work for that semester.

1. The students, who exit the 4-Year B. Tech. program after II Year of study and wish to re-join the B.Tech. program, must submit the 2 -Year B. Tech. (UG) Diploma Certificate awarded to him, subject to the eligibility for completion of Course / Degree.

2. A student may be permitted to take one year break after completion of II Year II Semester or B. Tech. III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the course **in next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

13.0 Withholding of results

13.1 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.

14.0 Transitory Regulations

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of R18, MLRS- R19, MLRS-R20 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R22 Regulations and he is required to complete the study of B.Tech. / B. Pharmacy programme within the stipulated period of eight academic years from the date of first admission in I Year.

2. A student who has been detained in any semester of II, III and IV years of R18, R19, R20 regulations for want of attendance, shall be permitted to join the corresponding semester of R22 Regulations and is required to complete the study of B.Tech. / B.Pharmacy within the stipulated period of eight academic years from the date of first admission in I Year. The R22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.

B. For students detained due to shortage of credits:

1. A student of R18 (or) MLRS-R19 (or) MLRS-R20 Regulations who has been detained due to lack of credits, shallbe promoted to the next semester of R22 Regulations only after acquiring the required number of credits as per the corresponding regulations of his / her first admission. The total credits required are 160 including both R18, R19, R20 & R22 regulations. The student is

required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The R22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in R22 Regulations:

1. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.

2. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his / her study including R22 Regulations. **There is NO exemption of credits in any case**.

3. If a student is readmitted to R22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R22 Regulations will be substituted by another subject to be suggested by the University.

Note: If a student readmitted to R22 Regulations and has not studied any subjects/topics in his / her earlier regulations of study which is prerequisite for further subjects in R22 Regulations, the College Principals concerned shall conduct remedial classes to cover those subjects / topics for the benefit of the students.

15.0 Student Transfers

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

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

15.3 The students seeking transfer to colleges affiliated to JNTUH from various other Universities / institutions have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the students have not studied at the earlier institution. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the students have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.

15.4 The transferred students from other Universities / Institutions to JNTUH affiliated colleges who are on rolls are to be provided one chance to write the CBT (for internal marks) in the **equivalent subject(s)** as per the clearance letter issued by the University.

15.5 The autonomous affiliated colleges have to provide one chance to write the internal examinations in the **equivalent subject(s)** to the students transferred from other Universities / institutions to JNTUH autonomous affiliated colleges who are on rolls, asper the clearance (equivalence) letter issued by the University.

16.0 Scope

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

16.2 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the College Academic Council is final.

16.3 Where the words “he”, “him”, “his”, occur in the regulations, they include “she”,“her”, “hers”.

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MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(An Autonomous Institution)
ACADEMIC REGULATIONS FOR B.TECH. (LATERAL ENTRY SCHEME) FROM THE AY 2023 – 24

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

The LES students after securing admission shall pursue a course of study for not lessthan three academic years and not more than six academic years.

2. The student shall register for 120 credits and secure 120 credits with CGPA ≥ 5 from II year to IV-year B.Tech. programme (LES) for the award of B.Tech. degree.

3. The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.

4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech.(LES).

5. Promotion rule

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	(i) Regular course of study of second year second semester. (ii) Must have secured at least 24 credits out of 40 credits i.e., 60% 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.
4	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester. (ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.

5	**Fourth year first semester to fourth year second semester**	**Regular course of study of fourth year first semester.**

6. All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

7. LES students are not eligible for 2-Year B. Tech. Diploma Certificate.

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Malpractices Rules

Disciplinary Action For / Improper Conduct in Examinations

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

	result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking awayanswer 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 University 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 andforfeits 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 andforfeits 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 college academic council for further action to award a suitable punishment.	

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MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section2(f) & 12(B)of the UGC act,1956

B.Tech - Electronics and Communication Engineering
Course Structure (MLRS-R22)
Applicable From 2022-23 Admitted Batch
Structure Breakup

S. No	Category	Breakup of credits (Total 160 credits)
1	Humanities and Social Sciences including Management Courses (HSMC)	10
2	Basic Sciences Courses (BS)	22.5
3	Engineering Sciences Courses including Workshop, Drawingbasics of Electrical/Mechanical/Computer etc.(ES)	19.5
4	Professional Core Courses (PC)	63
5	Professional Electives (PE)	18
6	Open Electives (OE)	9
7	Project work, Seminar and Internship in Industry or elsewhere (PS)	18
8	Mandatory Courses	-
TOTAL		**160**

I YEAR I SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2210001	Matrix Algebra & Calculus	BS	3	1	0	4	40	60	100
2	2210008	Applied Physics	BS	3	1	0	4	40	60	100
3	2210501	Programming for Problem Solving	ES	3	0	0	3	40	60	100
4	2210372	Engineering Workshop	ES	0	1	3	2.5	40	60	100
5	2210010	English for Skill Enhancement	HS	2	0	0	2	40	60	100
6	2210421	Elements of Electronics and Communication Engineering	PC	0	0	2	1	50	-	50
7	2210071	Applied Physics Laboratory	BS	0	0	3	1.5	40	60	100
8	2210571	Programming for Problem Solving Laboratory	ES	0	0	2	1	40	60	100
9	2210073	English Language and Communications Skills Laboratory	HS	0	0	2	1	40	60	100
10	2210021	Environmental Science	*MC	3	0	0	0	-	-	-
		Induction Programme	-	-	-	-	-	-	-	-
TOTAL				**14**	**3**	**12**	**20**	**370**	**480**	**850**

I YEAR II SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2220002	Differential Equations and Vector Calculus	BS	3	1	0	4	40	60	100
2	2220009	Engineering Chemistry	BS	3	1	0	4	40	60	100
3	2220371	Engineering Drawing Practice	ES	1	0	4	3	40	60	100
4	2220201	Basic Electrical Engineering	PC	2	0	0	2	40	60	100
5	2220422	Electronic Devices and Circuits	PC	2	0	0	2	40	60	100
6	2220572	Data Structures Laboratory	ES	0	1	2	2	40	60	100
7	2220072	Engineering Chemistry Laboratory	BS	0	0	2	1	40	60	100
8	2220271	Basic Electrical Engineering Laboratory	PC	0	0	2	1	40	60	100
9	2220476	Electronic Devices and Circuits Laboratory	PC	0	0	2	1	40	60	100
TOTAL				**11**	**3**	**12**	**20**	**360**	**540**	**900**

***MC- Satisfactory/Unsatisfactory**

II YEAR I SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2230003	Numerical Methods and Complex Variables	BS	3	1	0	4	40	60	100
2	2230423	Digital System Design	PC	3	0	0	3	40	60	100
3	2230424	Signals and Systems	PC	3	1	0	4	40	60	100
4	2230425	Probability Theory and Stochastic Processes	ES	3	0	0	3	40	60	100
5	2230426	Analog and Pulse Circuits	PC	3	0	0	3	40	60	100
6	2230477	Digital System Design Laboratory	PC	0	0	2	1	40	60	100
7	2230478	Basic Simulation Laboratory	PC	0	0	2	1	40	60	100
8	2230479	Analog and Pulse Circuits Laboratory	PC	0	0	2	1	40	60	100
9	2230022	Gender Sensitization	*MC	3	0	0	0	-	-	-
TOTAL				**18**	**2**	**6**	**20**	**320**	**480**	**800**

II YEAR II SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2240016	Business Economics and Financial Analysis	HS	3	0	0	3	40	60	100
2	2240427	Electromagnetic Theory and Transmission Lines	PC	2	1	0	3	40	60	100
3	2240428	Analog and Digital Communication	PC	2	1	0	3	40	60	100
4	2240429	Linear and Digital IC Applications	PC	3	0	0	3	40	60	100
5	2240503	Python Programming	ES	3	0	0	3	40	60	100
6	2240480	Analog and Digital Communication Laboratory	PC	0	0	2	1	40	60	100
7	2240481	Linear and Digital IC Applications Laboratory	PC	0	0	2	1	40	60	100
8	2240573	Python Programming Laboratory	ES	0	0	2	1	40	60	100
9	2240491	Field Based Project	PS	0	0	4	2	50	-	50
10	2240023	Constitution of India	*MC	3	0	0	0	-	-	-
TOTAL				**16**	**2**	**10**	**20**	**370**	**480**	**850**

***MC- Satisfactory/Unsatisfactory**

III YEAR I SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2250202	Control Systems	PC	3	0	0	3	40	60	100
2	2250404	Microprocessors and Microcontrollers	PC	3	1	0	4	40	60	100
3	2250430	Digital Design Through Verilog	PC	3	1	0	4	40	60	100
4		Professional Elective – I	PE	3	0	0	3	40	60	100
5		Open Elective – I	OE	3	0	0	3	40	60	100
6	2250011	Advanced English Communication Skills Laboratory	HS	0	0	2	1	40	60	100
7	2250473	Microprocessors and Microcontrollers Laboratory	PC	0	0	2	1	40	60	100
8	2250574	Database Management Systems Laboratory	ES	0	0	2	1	40	60	100
9	2250024	Intellectual Property Rights	*MC	3	0	0	0	-	-	-
TOTAL				**18**	**1**	**8**	**20**	**320**	**480**	**800**

III YEAR II SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2260431	Antennas and Wave Propagation	PC	2	1	0	3	40	60	100
2	2260432	Digital Signal Processing	PC	2	1	0	3	40	60	100
3	2260433	VLSI Design	PC	3	0	0	3	40	60	100
4		Professional Elective - II	PE	3	0	0	3	40	60	100
5		Open Elective – II	OE	3	0	0	3	40	60	100
6	2260482	Digital Signal Processing Laboratory	PC	0	0	3	1.5	40	60	100
7	2260483	VLSI Design Laboratory	PC	0	0	3	1.5	40	60	100
8	2260492	Industry Oriented Mini Project/Internship	PS	0	0	4	2	-	100	100
9	2220021	Environmental Science	*MC	3	0	0	0	-	-	-
TOTAL				**13**	**2**	**10**	**20**	**280**	**520**	**800**

***MC- Satisfactory/Unsatisfactory**

Environmental Science in III Yr II Sem Should be Registered by Lateral Entry Students only.

IV YEAR I SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1	2270434	Embedded System Design	PC	3	0	0	3	40	60	100
2	2270435	Microwave and Optical Communication	PC	3	0	0	3	40	60	100
3	2270017	Fundamentals of Management	HS	3	0	0	3	40	60	100
4		Professional Elective – III	PE	3	0	0	3	40	60	100
5		Open Elective – III	OE	3	0	0	3	40	60	100
6	2270484	Microwave and Optical Communication Laboratory	PC	0	0	4	2	40	60	100
7	2270493	Project Stage - I	PS	0	0	6	3	-	100	100
TOTAL				**15**	**0**	**10**	**20**	**240**	**460**	**700**

IV YEAR II SEMESTER

S. No.	Course Code	Course Name	Course Area	Periods per week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIE)	External (SEE)	Total
1		Professional Elective - IV	PE	3	0	0	3	40	60	100
2		Professional Elective - V	PE	3	0	0	3	40	60	100
3		Professional Elective - VI	PE	3	0	0	3	40	60	100
4	2280494	Technical Seminar	PS	0	0	4	2	100	-	100
5	2280495	Project Stage - II	PS	0	0	18	9	40	60	100
TOTAL				**9**	**0**	**22**	**20**	**260**	**240**	**500**

Professional Elective (PE) Courses

PE I - Professional Elective I

S. No.	Course Code	Course Title
1	2250436	Electronic Measurements and Instrumentation
2	2250522	R - Programming
3	2250437	Spread Spectrum Communications
4	2250509	Operating Systems

PE II - Professional Elective II

S. No.	Course Code	Course Title
1	2260438	Digital Image Processing
2	2260439	Cellular Mobile Communications
3	2260521	Artificial Neural Networks
4	2260520	Internet of Things

PE III - Professional Elective III

S. No.	Course Code	Course Title
1	2270440	Wireless Communications and Networks
2	2270441	Test and Testability
3	2270442	Fundamentals of Robotics
4	2290519	Cryptography & Network Security

PE IV - Professional Elective IV

S. No.	Course Code	Course Title
1	2280443	Biomedical Instrumentation
2	2280444	System on Chip Architecture
3	2280516	Artificial Intelligence
4	2280445	Satellite Communications

PE V - Professional Elective V

S. No.	Course Code	Course Title
1	2280446	Analog CMOS IC Design
2	2280447	Radar Systems
3	2280514	Machine Learning
4	2280448	Introduction to Nano Technology

PE VI - Professional Elective VI

S. No.	Course Code	Course Title
1	2280523	Cyber Security
2	2280449	FPGA Programming
3	2280450	Global Navigation Satellite System
4	2280451	Computer Vision

Open Elective (OE) Courses

S. No	Open Elective	Course Code	Course Title
1	Open Elective - I	2250406	Electronic Communications & Applications
2	Open Elective – II	2260407	Introduction to VLSI & Embedded Systems
3	Open Elective - III	2270408	Global Navigation Satellite System & Applications

Note: *Open Elective subject's syllabus is provided in a separate document. Student should take open electives from the list of offered by other departments/branches only.*

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2210001:MATRIX ALGEBRA AND CALCULUS(Common to all)

I Year B.Tech. ECE I – Sem. **L T P C**

3 1 0 4

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn

- Types of 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 eigen vectors and to reduce the quadratic form to canonical form
- Geometrical approach to the mean value theorems and their application to the mathematical problems. Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative and Finding maxima and minima of function of two and three variables
- Evaluation of multiple integrals and their applications

Course outcomes: At the end of this course, students will demonstrate the ability to

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

UNIT-I: Matrices **10 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 by Gauss elimination method, Gauss Seidel Iteration Method.

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

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 forms by Orthogonal Transformation.

UNIT-III: Calculus **10 L**

Mean value theorems: Rolle's Theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series (without proofs). Definition of Improper Integral: Beta and Gamma functions and their applications.

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

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) 8 L

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9thEdition, John Wiley & Sons,2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition, Pearson, Reprint, 2002.
3. H. K. Dassand Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, NewDelhi.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2210008: APPLIED PHYSICS

I Year B.Tech. ECE I – Sem. **L T P C**

3 1 0 4

Prerequisites: 10 + 2 Physics

Course Objectives:

- Understand the basic principles of quantum physics and band theory of solids.
- Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
- Study the fundamental concepts related to the dielectric, magnetic and energy materials.
- Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
- Study the characteristics of lasers and optical fibres.

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

- Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
- Identify the role of semiconductor devices in science and engineering Applications.
- Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
- Appreciate the features and applications of Nanomaterials.
- Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

UNIT - I: QUANTUM PHYSICS AND SOLIDS

Quantum Mechanics: Introduction to quantum physics, Blackbody radiation, Photoelectric effect, de-Broglie Hypothesis, Matter waves, Davisson and Germer experiment, Heisenberg uncertainty principle, Born interpretation of the wave function, Time independent Schrodinger's wave equation, Particle in one dimensional potential box.

Solids: Free electron theory (Drude & Lorentz, Sommerfeld) (qualitative), Bloch's theorem - Kronig-Penney model, Effective mass of an electron, Origin of energy bands, Classification of solids.

UNIT - II: SEMICONDUCTORS AND DEVICES

Intrinsic and Extrinsic semiconductors, Hall effect, Direct and Indirect band gap semiconductors, Construction, Principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT) - LED, PIN diode, Avalanche photo diode (APD) and solar cells, their structure, Materials, Working principle and characteristics.

UNIT - III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS

Dielectric Materials: Basic definitions, Types of polarizations (qualitative), Ferroelectric, Piezoelectric, and Pyroelectric materials, Applications.

Magnetic Materials: Domain theory of ferromagnetism, Soft and Hard magnetic materials, Magnetostriction, Magnetoresistance, Applications.

Energy Materials: Conductivity of liquid and solid electrolytes, Superionic conductors, Materials and electrolytes for super capacitors.

UNIT - IV: NANOTECHNOLOGY

Nanoscale, Quantum confinement, Surface to volume ratio, Bottom-up fabrication: Sol-gel, precipitation methods, Top-down fabrication: Ball milling, Physical vapor deposition (PVD), Characterization techniques: XRD, SEM and TEM, Applications of nano materials.

UNIT - V: LASER AND FIBER OPTICS

Lasers: Laser beam characteristics, Three quantum processes, Einstein coefficients and their relations, Lasing action, Population inversion, Pumping methods, Ruby laser, He-Ne laser, Nd:YAG laser, Applications of laser.

Fiber Optics: Introduction to optical fibers, Total internal reflection, Construction of optical fiber, Classification of optical fibers, Acceptance angle - Numerical aperture, Losses in optical fibers, Optical fiber for communication system, Applications of optical fibers.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics", S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4th Edition, 2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.
6. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group.
7. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.

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2210501: PROGRAMMING FOR PROBLEM SOLVING

I Year B.Tech. ECE 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: Introduction to Programming

Compilers, compiling and executing a program.

Algorithm – Flowchart / Pseudocode withexamples, Program design and structured programming

Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do- while loops

I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments

UNIT - II: Arrays, Strings, Structures and Pointers:

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays

Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

Structures: Defining structures, initializing structures, unions, Array of structures

Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation) Enumeration data type.

UNIT - III: Preprocessor and File handling in C:

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef

Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

UNIT - IV: Function and Dynamic Memory Allocation:

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types

UNIT - V: 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), Basic concept of order of complexity through the example programs

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, (3rdEdition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall ofIndia
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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2210372: ENGINEERING WORK SHOP

I Year B.Tech. ECE I – Sem. **L T P C**

0 1 3 2.5

Course Objectives:

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, Equipment and machines

Course Outcomes:

- Explain the design and model different prototypes in the carpentry trade such as Cross lap joint, Dove tail joint. (L4)
- Demonstrate the design and model various basic prototypes in the trade of fitting such as Straight fit, V- fit. (L4)
- Understand to make various basic prototypes in the trade of Tin smithy such as rectangular tray, and open Cylinder. (L4)
- Demonstrate the design and model various basic prototypes in the trade of Welding. (L4)
- Explain to make various basic prototypes in the trade of Black smithy such as J shape, and S shape. (L4)
- Understand to perform various basic House Wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch, connecting a fluorescent tube, Series wiring, Go down wiring. (L4)

UNIT I - CARPENTRY & FITTING

- **Carpentry** – Introduction, Carpentry tools, sequence of operations and applications (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
- **Fitting** – Introduction, fitting tools, sequence of operations and applications (V-Fit, Dovetail Fit & Semi-circular fit)

Learning Outcomes: Students should be able to,

- Understand the trade of carpentry and fitting. (L2)
- Explain the tools involved in manufacturing operations. (L3)
- Evaluate the applications of carpentry and fitting. (L4)

UNIT II - TIN SMITHY AND BLACKSMITHY

- **Tin-Smithy** – Introduction, Tin smithy tools, sequence of operations and applications (Square Tin, Rectangular Tray & Conical Funnel).
- **Blacksmithy**- Introduction, Blacksmithy tools, sequence of operations and applications (Round to Square, Fan Hook and S-Hook)

Learning Outcomes: Students should be able to,

- Understand the oldest manufacturing methods. (L2)
- Describe the sequence of operations involved. (L3)
- Explain the safety precautions and tools usage. (L4)

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UNIT III - HOUSE WIRING AND WELDING

- **House-wiring** – Introduction, Electrical wiring tools, sequence of operations and applications (Parallel & Series, Two-way Switch and Tube Light)
- **Welding Practice** – Introduction, electrode, welding tools, and sequence of operations. Advantages and applications (Arc Welding)

Learning Outcomes:

- Students should be able to,
- Discuss the topic of Heat engines.(L3)
- Identify types of Heat engines cycles.(L5)
- Evaluate the Factors affecting routing procedure, Route Sheet.(L4)

Text Books:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

References:

1. Work shop Manual – P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP

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2210010: ENGLISH FOR SKILL ENHANCEMENT

I Year B.Tech. ECE I – Sem. **L T P C**

2 0 0 2

Course Objectives: This course will enable the students to:

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

Course Outcomes: Students will be able to:

1. Understand the importance of vocabulary and sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
6. Acquire basic proficiency in reading and writing modules of English.

UNIT - I

Chapter entitled '***Toasted English***' **by R.K.Narayan** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Writing: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing precisely – Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT - II

Chapter entitled **'Appro JRD' by Sudha Murthy** from ***"English: Language, Context and Culture"published*** by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

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

Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

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UNIT - III

Chapter entitled **'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al** from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.

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

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

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter ofRequisition, Email Etiquette, Job Application with CV/Resume.

UNIT - IV

Chapter entitled **'Art and Literature' by Abdul Kalam** from ***"English: Language, Context andCulture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

UNIT - V

Chapter entitled **'Go, Kiss the World' by Subroto Bagchi** from ***"English: Language, Context andCulture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Technical Vocabulary and their Usage

Grammar: Common Errors in English (*Covering all the other aspects of grammar which were notcovered in the previous units*)

Reading: Reading Comprehension-Exercises for Practice

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

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

- **Note: 1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is* ***Open-ended,*** besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.

- **Note**: **2**.Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents .They are advised to teach 40 percent of each topic from the syllabus in blended mode.

TEXT BOOKS:

1. "English: Language, Context and Culture" by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS:

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge

University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2210421: ELEMENTS OF ELECTRONICS AND COMMUNICATION ENGINEERING

I Year B.Tech. ECE I – Sem.

L	T	P	C
0	0	2	1

Course outcomes: Students will be able to

- Identify the different components used for electronics applications
- Measure different parameters using various measuring instruments
- Distinguish various signal used for analog and digital communications

List of Experiments:

1. Understand the significance of Electronics and communications subjects
2. Identify the different passive and active components
3. Color code of resistors, finding the types and values of capacitors
4. Measure the voltage and current using voltmeter and ammeter
5. Measure the voltage, current with Multimeter and study the other measurements using Multimeter
6. Study the CRO and measure the frequency and phase of given signal
7. Draw the various Lissajous figures using CRO
8. Study the function generator for various signal generations
9. Study of Spectrum analyzer and measure the spectrum
10. Operate Regulated power supply for different supply voltages
11. Study the various gates module and write down the truth table of them
12. Identify various Digital and Analog ICs
13. Observe the various types of modulated signals.
14. Know the available Softwares for Electronics and communication applications

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2210071: APPLIED PHYSICS LABORATORY

I Year B.Tech. ECE I – Sem. **L T P C**

0 0 3 1.5

Course Objectives: The objectives of this course for the student to

- Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
- Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and Resistivity of semiconductor materials.
- Able to measure the characteristics of dielectric constant of a given material.
- Study the behavior of B-H curve of ferromagnetic materials.
- Understanding the method of least squares fitting.

Course Outcomes: The students will be able to:

- Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
- Appreciate quantum physics in semiconductor devices and optoelectronics.
- Gain the knowledge of applications of dielectric constant.
- Understand the variation of magnetic field and behavior of hysteresis curve.
- Carried out data analysis.

LIST OF EXPERIMENTS:

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode.
5. Input and output characteristics of BJT (CE, CB & CC configurations).
6. V-I and L-I characteristics of light emitting diode (LED) and LASER.
7. V-I Characteristics of solar cell.
8. Determination of Energy gap of a semiconductor.
9. To determine the time constant of R-C circuit.
10. Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
11. Understanding the method of least squares – Torsional pendulum as an example.
12. Determination of magnetic field induction along the axis of a current carrying coil.

REFERENCE BOOKS:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers, 2017.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2210571: PROGRAMMING FOR PROBLEMSOLVING LABORATORY

I Year B.Tech. ECE I – Sem. **L T P C**

0 0 2 1

[Note: The programs may be executed using any available Open Source/ Freely available IDESome of the Tools available are:
CodeLite: https://codelite.org/ Code: Blocks:
http://www.codeblocks.org/
DevCpp: http://www.bloodshed.net/evcpp.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 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
- Able to develop programs based on condition checking
- Implement pyramid programs
- Able to perform matrix applications
- Modularize the code with functions so that they can be reused
- Create, read and write to and from simple text and binary files

Simple numeric problems:

a. Write a program for the simple, compound interest.
b. Write a program to implement bit-wise operators.
c. Write a program for converting Fahrenheit to Celsius.
d. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values from standard input.
e. Writeasimpleprogramtofindlargestoftwoandthreenumbersusingconditionaloperator.
f. Writeaprogramforswappingtwonumberswithandwithoutusingthirdvariableandusingbitwiseoperators.

Condition branching and statements:

a. Write a program for finding larges of three numbers.

b. Write a program that declares Class awarded for a given percentage of marks, where marks<40%=Failed, 40% to<60% = Second class, 60% to<70%=First class, >=70%=Distinction. Read percentage from standard input.
c. Write a C program to find the roots of a Quadratic equation.
d. 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)

Condition branching and loops:

a. Write a program to find whether the given number is a prime or not.
b. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
c. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, number=5 and no. of rows = 3, the output should be:

5x1=5
5x2=10
5x3=15

d. Write a program that shows the binary equivalent of a given positive number between0to255.
e. 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.
f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
g. Write a C program to calculate the following ,where x is a fractional value.$1-x/2+x^2/4-x^3/6$
h. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:$1+x+x^2+x^3+….+x^n$. For example: if n=3 and x=5, then the program compute1+5+25+125.
i. Write a C program to construct a pyramid of numbers as follows:

1	*	1	1	*
12	**	23	22	**
123	***	456	333	***
			4444	**
				*

j. Write a C program to find given number is Armstrong number or not.
k. Write a C program to find given number is Perfect number or not.

Arrays, Strings, Pointers and Structures:

a. Write a C program to find the minimum, maximum and average in an array of integers.

b. Write a program to compute Mean, Variance, Standard Deviation, Sorting of n elements in single dimension array.

c. Write a C program that perform the following:
   i. Addition of Two Matrices
   ii. Multiplication of Two Matrices
   iii. Transposeofamatrixwithmemorydynamicallyallocatedforthenewmatrixasrowandcolumncounts may not be same.
d. Write a C program that sorts a given array of names.
e. Write a C program that perform the following operations:
   i. To insert a sub-string into a given main string from a given position.
   ii. To delete n Characters from a given position in a given string.
f. Write a program for reading elements using pointer in to array and display the values using array.
g. Write a program for display values reverse order from array using pointer.
h. Write a program through pointer variable to sum of n elements from array.
i. Write a program to implement student information by using structure to function.
j. Write a program to sort student id or name using structures.

Functions:

a. Write a C program to find factorial of a given number using functions.
b. Write a C program to perform swapping using functions.
c. Write a C program to find LCM, GCD of two numbers using functions.
d. Write a C program to implement sorting using functions.
e. Write a C program to create and print two dimensional array using functions.
f. Write a C program to find factorial of a given number using recursion.
g. Write a C program to find Fibonacci series using recursion
h. Write a C program to implement Towers of Hanoi problem using recursion.

Files:

a. Write a C program to display the contents of a file to standard out put device.
b. Write a C program which copies one file to another, replacing all lower case characters with their upper case equivalents.
c. Write a C program to count the occurrence of a character in a text file. The file name and the character are supplied as command line arguments.
d. Write a C program to merge two files in to a third file (i.e. ,the contents of the first file followed by those of these cond are put in the third file).

CASE STUDY I: Develop Sample Student Data base

Create a structure to specify data on students given below: Roll number, Name, Department, Course, Year of joining

Assume that there are not more than 15 students in the collage.

(a) Write a function to print names of all students who joined in a particular year.
(b) Write a function to print the data of a student whose roll number is given.

CASE STUDY 2: Perform simple Bank Transactions

Create a structure to specify data of customers in a bank. The data to be stored is: Account number, Name, Balance in account. Assume maximum of 20 customers in the bank.

(a) Write a function to print the Account number and name of each customer with balance below Rs. 100.
(b) If a customer request for withdrawal or deposit, it is given in the form: Acct. no, amount, code (1 for deposit, 0 for withdrawal)
Write a program to give a message, "The balance is insufficient for the specified with drawal".

CASE STUDY 3: Provide Serial Numbers for Engine parts

An automobile company has serial number for engine parts starting from AA0 to FF9. The other characteristics of parts to be specified in a structure are: Year of manufacture, material and quantity manufactured.
(a) Specify a structure to store information corresponding to a part.
(b) Retrieve information on parts with serial numbers between BB1 and CC6.

Reference Books

1. Byron Gottfried, Schaum"s Outline of Programming with C, Mc Graw-Hill
2. Let us C by YashavantKanetkar BPB publications(16thEdition)
3. B.A.ForouzanandR.F.GilbergCProgrammingandDataStructures,CengageLea rning,(3rdEdition)
4. BrianW.KernighanandDennisM.Ritchie,TheCProgrammingLanguage,PrenticeHallof India
5. R. G. Dromey, How to solve It by Computer, Pearson(16thImpression)
6. Programming in C, Stephen G.Kochan, Fourth Edition, and Pearson Education.
7. Herbert Schildt, C:TheCompleteReference, McGrawHill,4thEdition.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2210073: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

I Year B.Tech. ECE I – Sem. **L T P C**

0 0 2 1

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

Course Objective

- ✓ To facilitate computer-assisted multi-media instruction enabling individualized andindependent language learning
- ✓ To sensitize the students to the nuances of English speech sounds, word accent,intonation and rhythm
- ✓ To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- ✓ To improve the fluency of students in spoken English and neutralize the impact ofdialects.
- ✓ To train students to use language appropriately for public speaking, groupdiscussions and interviews

Course Outcomes: Students will be able to:

- ✓ Understand the nuances of English language through audio- visual experience and groupactivities
- ✓ Neutralise their accent for intelligibility
- ✓ Speak with clarity and confidence which in turn enhances their employability skills

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

a. **Computer Assisted Language Learning (CALL) Lab**
b. **Interactive Communication Skills (ICS) Lab**

Listening Skills:

Objectives

1. To enable students develop their listening skills so that they may appreciate the role in theLSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speechof people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening

- Listening for specific information

Speaking Skills:

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professionalcontexts

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities
- Just A Minute (JAM) Sessions

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

Exercise – ICALL Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. *Practice*: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*

ICS Lab:

Understand: Spoken vs. Written language- Formal and Informal English.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave –Introducing Oneself and Others.

Exercise – IICALL Lab:

Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern insentences – Intonation.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress patternin sentences – Intonation - *Testing Exercises*

ICS Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication.

Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requestsand Seeking Permissions - Telephone Etiquette.

Exercise - IIICALL Lab:

Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).

Practice: Common Indian Variants in Pronunciation – Differences between British and AmericanPronunciation -*Testing Exercises*

ICS Lab:

Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing

Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thankingand Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise – IVCALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests - *Testing Exercises*

ICS Lab:
Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.
Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise – VCALL Lab:
Understand: Listening for Specific Details.
Practice: Listening Comprehension Tests -*Testing Exercises*

ICS Lab:
Understand: Group Discussion
Practice: Group Discussion

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 followingspecifications:

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.

Source of Material (Master Copy):

- *Exercises in Spoken English. Part 1,2,3*. CIEFL and Oxford University Press

Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

Suggested Software:

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

REFERENCE BOOKS:

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* CengageLearning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* CambridgeUniversity Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* Oxford UniversityPress
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* CambridgeUniversity Press.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2210021: ENVIRONMENTAL SCIENCE

I Year B.Tech. ECE I – Sem. **L T P C**

3 0 0 0

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

Course Outcomes:

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development.

UNIT - I

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

UNIT - II

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

UNIT - III

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

UNIT - IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of
pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil.

Noise Pollution: Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental**

Issues and Global Efforts: Climate change and impacts on human environment. Ozone depletion
and Ozone depleting substances (ODS). Deforestation and desertification. International conventions /
Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water,R22 B.Tech. ECE Syllabus JNTU HYDERABAD biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

Towards Sustainable Future: Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

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

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2220002: DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS(Common to all)

I Year B.Tech. ECE II – Sem. **L T P C**

3 1 0 4

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives: To learn

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

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

CO1: Identify whether the given first order differential equation is exact or not.
CO2: Solve higher differential equation and apply the concept of differential equation to real world problems.
CO3: Use the Laplace transforms techniques for solving ODE's.
CO4: Apply the Del operator to scalar and vector point functions.
CO5: Evaluate the line, surface and volume integrals and converting them from one to another.

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

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**

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{ax}, sin ax , cos ax, polynomials in x, e^{ax} V(x) and x V(x), method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

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

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

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

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

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9thEdition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. H. K. Dassand Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, NewDelhi.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2220009: ENGINEERING CHEMISTRY

I Year B.Tech. ECE II – Sem. **L T P C**

3 1 0 4

Course Objectives:

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skills required to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

Course Outcomes:

1. Students will acquire the basic knowledge of electrochemical procedures related to corrosion and its control.
2. The students are able to understand the basic properties of water and its usage in domestic and industrial purposes.
3. They can learn the fundamentals and general properties of polymers and other engineering materials.
4. They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.

UNIT - I: Water and its treatment: [8]

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation- Determination of F^- ion by ion- selective electrode method. Boiler troubles: Sludges, Scales 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 water – Reverse osmosis.

UNIT – II Battery Chemistry & Corrosion [8]

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods.

UNIT - III: Polymeric materials: [8]

Definition – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene

Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP).

Rubbers: Natural rubber and its vulcanization.

Elastomers: Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.

Conducting polymers: Characteristics and Classification with examples-mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

UNIT - IV: Energy Sources: [8]

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.

UNIT - V: **Engineering Materials: [8]**

Cement: Portland cement, its composition, setting and hardening.

Smart materials and their engineering applications

Shape memory materials- Poly L- Lactic acid. Thermoresponse materials- Polyacryl amides, Poly vinyl amides

Lubricants: Classification of lubricants with examples-characteristics of a good lubricants - mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.
4. Textbook of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

REFERENCE BOOKS:

1. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2220371: ENGINEERING DRAWING PRACTICE

I Year B.Tech. ECE II – Sem. **L T P C**

1 0 4 3

Pre-requisites: Knowledge in dimensions and units, Usage of geometrical instruments and analytical ability

COURSE OBJECTIVES

- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection of objects.
- To draw sectional views and pictorial views of solids.

COURSE OUTCOMES: After completion of the course the student is able to

- Familiarize with BIS standards and conventions used in engineering graphics. (L3)
- Draw various engineering curves e.g., ellipse, parabola, cycloids and involutes etc. andconstruct various reduced scales e.g., plain and diagonal scale. (L2)
- Ability to draw orthographic projections and isometric projections of given engineering components. (L3)
- Visualize different views like elevation and plan for a given line, plane figures or solidobjects. (L2)
- Develop the lateral surfaces of simple solids. (L5)
- To know about isometric projection. (L2)

UNIT – I **CLASSES:12**

Introduction To Engineering Drawing

Principles of Engineering Graphics and their Significance-Drawing Instruments and their Uses-Conventions in Drawing-BIS -Lettering and Dimensioning.

Geometrical Constructions: Bisecting a Line, Arc. Dividing A Line into 'N' Equal Parts, Construction of Polygons, Division of Circle into Equal Parts (8 And 12)

Construction of Scales: Plain and Diagonal Scale.

Conic Sections: Ellipse, Parabola, Hyperbola and Rectangular Hyperbola- GeneralMethods only.

Engineering Curves: Cycloid, Epicycloid, Hypocycloid.

Involutes: For Circle, Triangle, Square, Pentagon and Hexagon.

LEARNING OUTCOME:

1. To understand the basic standards, conventions of engineering drawing and how to use the instruments in drawing. (L1)
2. Learn and draw the various types of curves used in engineering application. (L2)

UNIT –II **CLASSES:12**

Orthographic Projections

Principles- Assumptions- Different Angles of Projection.

Projections of Points- Located in all the quadrants

Projections of Lines- Parallel, Perpendicular, inclined to one plane and inclined to both planes.

Projections of Planes: Simple and auxiliary position of a plane.

LEARNING OUTCOME:

1. Knowledge in various planes of projections. (L1)
2. To draw the front view, top view and side views of the given geometrical elements. (L2)

UNIT–III **CLASSES :09**

Projections Of Solids

Classification of solids- simple and inclined to one plane position of Prisms, Pyramids, Cylinder and Cone

LEARNING OUTCOME:

1. To understand the various solid types. (L2)
2. To draw all the views of the given solid in all possible orientations. (L3)

UNIT – IV **CLASSES :12**

Section Of Solids

Types of Section Planes, Sectioning of Prisms, Pyramids, Cylinders and Cones.

Development Of surfaces

Development of surfaces of right Regular Solids- Parallel Line Method, Radial Line Method.

LEARNING OUTCOME:

1. To identify the cut surfaces and represent the sectional views graphically when the solid is sectioned. (L4)
2. To develop the surfaces of solid using various methods. (L5)

UNIT – V **CLASSES :09**

Isometric Projections

Principles, Isometric Views of Planes, Solids- Box Method, Offset Method, Compound solids, Sectioned Solids. Conversion of Isometric to Multi view projection. And vice versa

LEARNING OUTCOME:

1. Knowledge in principles of isometric projection. (L2)
2. Conversion of isometric to orthographic and vice-versa. (L2)

TEXT BOOKS:

1. N.D.Bhatt, Elementary Engineering Drawing, Charotar Publishers,2012.
2. K.Veenugopal, –Engineering Drawing and Graphics + AutoCAD New Age International Pvt. Ltd, 2011.
3.

REFERENCE BOOKS:

1. Engineering graphics with Auto CAD- R.B. Choudary/Anuradha Publishers Engineering Drawing- Johle/Tata Macgraw Hill.
2. Basanth Agrawal and C M Agrawal –Engineering Drawing 2nd Edition -McGraw-Hill Education (India) Pvt.Ltd

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2220201: BASIC ELECTRICAL ENGINEERING
(Common to ECE, CSE, CSC,CSD, CSM, CSIT & IT)

I Year B.Tech. ECE II – Sem. **L T P C**

2 0 0 2

Course Prerequisites: Nil

Course Objectives:

- To analyse and solve electric circuits.
- To provide an understanding of basics in Electrical circuits.
- To identify the types of electrical machines for a given application.
- To explain the working principles of Electrical Machines and single phase transformers.

Course Outcomes:

After completion of this course the student is able to

- Analyse Electrical circuits to compute and measure the parameters of Electrical Energy.
- Comprehend the working principles of Electrical DC Machines.
- Identify and test various electrical switchgear, single phase transformers and assess the ratings needed in given application.
- Comprehend the working principles of electrical AC machines.

UNIT-I: DC Circuits:

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin's and Norton's Theorems.

Learning Outcomes: At the end of this unit, the student will be able to

- Explain the need of circuit elements. (L2)
- Analyse the resistive circuits with independent sources. (L4)
- Solve D.C. circuits by using KVL and KCL. (L3)
- Apply network theorems for solving D.C. circuit problems. (L3)

Unit-II: AC Circuits:

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

Learning Outcomes: At the end of this unit, the student will be able to

- Develop an understanding of the fundamental laws and elements of A.C circuits. (L3)
- Learn the energy properties of electric elements and the techniques to measure voltage and current. (L2)
- Explain the concept of steady state. (L2)

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

Learning Outcomes: At the end of this unit, the student will be able to

- Demonstrate knowledge of construction and operating principles of single-phase transformers. (L3)
- Determine losses, efficiency, and voltage regulation of a transformer under specific operating conditions. (L5)
- Identify the connections of a three phase transformer. (L3)
- Illustrate the performance characteristics of different induction motors. (L3)

UNIT-IV: Electrical Machines:
Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dcmotor. Construction and working of synchronous generators.

Learning Outcomes: At the end of this unit, the student will be able to

- Explain construction & working of induction motor - DC motor. (L2)
- Perform speed control of DC Motor. (L3)
- Explain principle and operation of DC Generator & Motor. (L2)

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

Learning Outcomes: At the end of this unit, the student will be able to

- Understand working principles of LT Switchgear components. (L2)
- Perform elementary calculations for energy consumption, power factor improvement and battery backup. (L3)

Text Books:

1. Basic Electrical Engineering - By M.S.Naidu and S. Kamakshaiah – TMH.
2. Basic Electrical Engineering –By T.K.Nagasarkar and M.S. Sukhija Oxford University Press.

Reference Books:

1. Theory and Problems of Basic Electrical Engineering by D.P.Kothari & I.J. Nagrath PHI.
2. Principles of Electrical Engineering by V.K Mehta, S.Chand Publications.
3. Essentials of Electrical and Computer Engineering by David V. Kerns, JR. J. David Irwin Pearson.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2220422: ELECTRONIC DEVICES AND CIRCUITS

I Year B.Tech. ECE II – Sem. **L T P C**

2 0 0 2

Pre-requisites: Knowledge on Basic Electrical Engineering and Semiconductor Device Physics

Course Objectives:

- To introduce components such as Diodes, BJTs and FETs
- To know the applications of semiconductor devices
- To study special purpose semiconductor devices
- To give understanding of various types of amplifier circuits
- To design and analyze the different small-signal amplifier circuits

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

- Understand the characteristics of various semiconductor components
- Understand the utilization of components
- Understand the biasing techniques
- Design and analyze small signal amplifier circuits
- Analyze the BJT and FET amplifiers operation

UNIT– I

PN Junction Diode and Applications:

Operation and characteristics of PN junction diode, PN junction current, Static and Dynamic resistances, Load line analysis, Diffusion and Transition Capacitances, Diode Configurations, Rectifiers – HWR, FWR, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters; Clippers and Clampers.

UNIT – II

Bipolar Junction Transistor (BJT): Principle of Operation - Common Emitter, Common Base and Common Collector Configurations; Transistor as a switch, Transistor Biasing and Stabilization - Load line analysis, Biasing – Fixed-Bias, Self-Bias, Voltage-Divider bias, Bias Stability, Bias Compensation using Diodes.

UNIT – III

Field Effect Transistor (FET): Construction, Principle of Operation, Pinch-off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, Biasing of FET, FET as Voltage Variable resistor. MOSFET operation, MOSFET Characteristics in Enhancement and Depletion mode, MOS as a Capacitor.

UNIT – IV

Analysis and Design of Small Signal Low Frequency BJT Amplifiers: Transistor hybrid model, Determination of h-parameters from transistor characteristics, Typical values of h-parameters in CE, CB and CC configurations, Transistor amplifying action, Analysis of CE, CC, CB Amplifier, Low frequency response of BJT Amplifiers, Effect of coupling and bypass capacitors on CE Amplifier.

UNIT – V

FET Amplifiers: FET Small Signal Model**,** Analysis of JFET Amplifiers- CS, CD, CG configurations; Basic Concepts of MOS Amplifiers.

Special Purpose Devices: Zener diode, Voltage Regulator, SCR, Photo diode and Solar Cell – Characteristics, Operations and Applications.

TEXT BOOKS:

1. Jacob Millman, Christos C. Halkias, and Satyabrata Jit, “Electronic Devices and Circuits”, 3rd Edition., Mc-Graw Hill Education, 2010.
2. Robert L. Boylestad, Louis Nashelsky, “Electronic Devices and Circuits theory” 11th Edition, Pearson**,** 2013.

REFERENCES:

1. Donald Neamen, Dhrubes Biswas, “Semiconductor Physics and Devices” 4th Edition, McGraw Hill Education, 2017.
2. Steven T. Karris, “Electronic Devices and Amplifier Circuits with MATLAB Applications” Orchard Publications, 3rd Edition 2005.
3. Paul Horowitz, Winfield Hill, “The Art of Electronics” 3rd Edition Cambridge University Press, 1994.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2220572: DATA STRUCTURES LABORATORY

I Year B.Tech. ECE II – Sem. **L T P C**

0 1 2 2

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, and data
- structures like stacks, queues and linked lists.
- Ability to Implement searching and sorting algorithms

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
3. Write a program that uses functions to perform the following operations on circular linked list: i) Creation ii) Insertion iii) Deletion
4. Write a program that implement stack operations using i) Arrays ii) Pointers
5. Write a c program to implement infix to postfix conversion using stack.
6. Write a c program to implement postfix evaluation.
7. Write a program that implement Queue operations using i) Arrays ii) Pointers
8. Write a program that implements the following sorting methods to sort a given list of Integers in ascending order i) Bubble sort ii) Selection sort iii) Insertion sort
9. Write a program that implements the following sorting methods to sort a given list of Integers in ascending order i) Merge sort ii) Quick sort
10. Write a program that use both recursive and non-recursive functions to perform the Following searching operations for a Key value in a given list of integers: i) Linear search ii).Binary search
11. Write a program to implement the tree traversal methods
12. Write a program to implement the graph traversal methods.

CASE STUDY-1 Balanced Brackets

A bracket is considered to be any one of the following characters: (,), {, }, [, or].
Two brackets are considered to be a *matched pair* if the an opening bracket (i.e., (, [, or {) occurs to the left of a closing bracket (i.e.,),], or }) *of the exact same type*. There are three types of matched pairs of brackets: [], {}, and ().
A matching pair of brackets is *not balanced* if the set of brackets it encloses are not matched. For example, {[(])} is not balanced because the contents in between { and } are not balanced. The pair of square brackets encloses a single, unbalanced opening bracket, (, and the pair of parentheses encloses a single, unbalanced closing square bracket,].
By this logic, we say a sequence of brackets is *balanced* if the following conditions are met:

- It contains no unmatched brackets.
- The subset of brackets enclosed within the confines of a matched pair of brackets is also a matched pair of brackets. Given strings of brackets, determine whether each sequence of brackets is balanced. If a string is balanced, return YES. Otherwise, return NO.

CASE STUDY-2 Minimum Average Waiting Time

Mr. Raju owns a pizza restaurant and he manages it in his own way. While in a normal restaurant, a customer is served by following the first-come, first-served rule, Raju simply minimizes the average waiting time of his customers. So he gets to decide who is served first, regardless of how sooner or later a person comes.

Different kinds of pizzas take different amounts of time to cook. Also, once he starts cooking a pizza, he cannot cook another pizza until the first pizza is completely cooked. Let's say we have three customers who come at time t=0, t=1, & t=2 respectively, and the time needed to cook their pizzas is 3, 9, & 6 respectively. If Raju applies first-come, first-served rule, then the waiting time of three customers is 3, 11, & 16 respectively. The average waiting time in this case is (3 + 11 + 16) / 3 = 10. This is not an optimized solution. After serving the first customer at time t=3, Raju can choose to serve the third customer. In that case, the waiting time will be 3, 7, & 17 respectively. Hence the average waiting time is (3 + 7 + 17) / 3 = 9.

Help Raju achieve the minimum average waiting time. For the sake of simplicity, just find the integer part of the minimum average waiting time.

Note:

- The waiting time is calculated as the difference between the time a customer orders pizza (the time at which they enter the shop) and the time she is served.
- Cook does not know about the future orders.

TEXT BOOKS:

1. Fundamentals of data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2nd Edition, Universities Press.
2. Data structures using C, A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

REFERENCES:

1. Data structures: A Pseudocode Approach with C, R.F.GilbergAndB.A.Forouzan, 2nd Edition, Cengage Learning.
2. Introduction to data structures in C, Ashok Kamthane, 1st Edition, PEARSON

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2220072: ENGINEERING CHEMISTRY LABARORARY

I Year B.Tech. ECE II – Sem. **L T P C**

0 0 2 1

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
- Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

Course Outcomes: The experiments will make the student gain skills on:

- Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
- Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
- Students are able to prepare polymers like bakelite and nylon-6.
- Estimations saponification value, surface tension and viscosity of lubricant oils.

List of Experiments:

I. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.
II. **Conductometry:** Estimation of the concentration of an acid by Conductometry.
III. **Potentiometry:** Estimation of the amount of Fe^{+2} by Potentiomentry.
IV. **pH Metry:** Determination of an acid concentration using pH meter.
V. **Preparations:**
   1. Preparation of Bakelite.
   2. Preparation Nylon – 6.
VI. **Lubricants:**
   1. Estimation of acid value of given lubricant oil.
   2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.
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 its 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).

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2220271: BASIC ELECTRICAL ENGINEERING LABORATORY
(Common to ECE, CSE, CSC, CSD, CSM, CSIT& IT)

I Year B.Tech. ECE II – Sem.

L	T	P	C
0	0	2	1

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:

- Get an exposure to basic electrical laws.
- Understand the response of different types of electrical circuits to different excitations.
- Understand the measurement, calculation and relation between the basic electrical parameters
- Understand the basic characteristics of transformers and electrical machines.

List of experiments/demonstrations:

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Verification of superposition theorem.
4. Verification of Thevenin's and Norton's theorem.
5. Resonance in series RLC circuit.
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits.
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer.
8. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor.
9. Torque-Speed Characteristics of a Three-phase Induction Motor.

   Any two experiments from the given list
10. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
11. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
12. Measurement of Active and Reactive Power in a balanced Three-phase circuit
13. No-Load Characteristics of a Three-phase Alternator

TEXT BOOKS:

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

REFERENCE BOOKS:

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

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2220476: ELECTRONIC DEVICES AND CIRCUITS LABORATORY

B.Tech. I Year - II – Sem.

L	T	P	C
0	0	2	1

Course Objectives:

- To know the characteristics of PN junction diode
- To measure the efficiency of half wave and full wave rectifiers
- To study the BJT operation
- To know the switching characteristics of SCR
- To design the clipper and clamper circuits

Course Outcomes:

At the end of the laboratory work, students will be able to

- Identify the two terminal and three terminal devices like diode and Transistor
- Understand the PN Junction diode characteristics in forward and reverse bias
- Analyses the transistor characteristics in different configurations
- Measure the h-parameters from the transistor configuration
- Design the characteristics of clipper and clamper with and without reference voltages

List of Experiments:

1. PN Junction diode characteristics: (a) Forward bias (b) Forward bias
2. Half and Full Wave Rectifier with & without filters
3. Clippers at different reference voltages
4. Clampers at different reference voltages
5. Test the powered backup system using diode
6. Input and output characteristics of BJT in CE, CB, CC Configuration
7. CE and CC amplifier characteristics
8. Logic gates using BJT
9. Voltage level indicator
10. Verify the Common Source amplifier characteristics
11. Input and output characteristics of FET in CS Configuration
12. Transistor as a switch to control the on–off states of a bulb
13. Zener diode as a voltage regulator
14. Verify the SCR Characteristics

NOTE: Minimum of 12 experiments to be conducted.

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2230003: NUMERICAL METHODS AND COMPLEX VARIABLES

II Year B.Tech. ECE I – Sem.

L	T	P	C
3	1	0	4

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

Course Objectives: To learn

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

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

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

UNIT-I: Numerical Methods-I **10L**

Solution of polynomial and transcendental equations: Bisection method, Iteration Method, Newton-Raphson method and Regula-Falsi method. Methods for solving linear systems of equations (Gauss Jacobi method).

Finite differences: forward differences, backward differences, central differences, symbolic relations and separation of symbols, Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae, Lagrange's method of interpolation.

UNIT-II: Numerical Methods-II **8L**

Numerical integration: Trapezoidal rule and Simpson's $1/3^{rd}$ and $3/8^{th}$ rules.

Ordinary differential equations: Taylor's series, Picard's method, Euler and modified Euler's methods, Runge-Kutta method of fourth order for first order ODE.

UNIT-III Fourier series & Fourier Transforms **10L**

Fourier series - Dirichlet's Conditions - Half-range Fourier series - Fourier Transforms: Fourier Sine and cosine transforms-Inverse Fourier transforms.

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

Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate, Conformal mappings, Mobius transformations.

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

Line integrals, Cauchy's theorem, Cauchy's Integral formula, zeros of analytic functions, singularities, Taylor's series, Laurent's series, Residues, Cauchy Residue theorem and their properties,(all theorems without Proofs).

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition,2010.
2. S. S. Sastry, Introductory methods of Numerical analysis, PHI, 4thEdition,2005.

REFERENCE BOOKS:

1. M. K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations, New Age International publishers.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley& Sons,2006.
3. J. W. Brown and R.V. Churchill, Complex Variables and Applications,7th Edition, Mc-GrawHill,2004.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2230423: DIGITAL SYSTEM DESIGN

II Year B.Tech. ECE I – Sem.

L	T	P	C
3	0	0	3

Pre-requisite: Nil

Course Objectives:

- Understand the number systems in logic circuits
- Learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems
- Implement simple logical operations using combinational logic circuits and design of sequential logic circuits
- Analyze sequential circuits systems in terms of state machines
- Analyze the concepts of programmable logic devices

Course Outcomes:

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

- Introduce the numerical information in different forms and Boolean Algebra theorems
- Implement the Boolean algebra and to minimize combinational functions
- Design and analyze small combinational circuits and to use standard Combinational functions
  to build larger more complex circuits
- Implement small sequential circuits and devices and to use standard sequential Function blocks to build larger more complex circuits
- Understand the operation of PLD & PLA

UNIT – I

Number Systems: Number systems, Complements of numbers, Codes- weighted and Non-weighted codes and its properties, Parity check code and Hamming code.

Boolean Algebra: Basic theorems and properties, Switching functions- Canonical and standard form, Algebraic simplification, Digital logic gates, EX-OR gates, Universal gates, Multilevel NAND/NOR realizations, and their applications.

UNIT – II

Minimization of Boolean Functions: Karnaugh Map method - Up to five variables, Don't Care map entries, Quine Mc Cluskey, and Tabular method.

Combinational Logic Circuits: Adders, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters, Hazards and Hazard Free relations.

UNIT – III

Sequential Circuits Fundamentals: Basic architectural distinctions between combinational and sequential circuits, SR latch, flip flops: SR, JK, JK master slave, D and T type flip flops, Excitation table of all flip flops, Timing and triggering consideration, Conversion from one type of flip-flop to another.

Registers and Counters: Shift registers – left, right and bidirectional Shift Registers, Applications of shift registers - Design and operation of ring and twisted ring counter, Operation of asynchronous and synchronous counters.

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UNIT – IV

Sequential Machines: Finite state machines, Synthesis of synchronous sequential circuits- Serial binary adder, Sequence detector, Parity-bit generator, Synchronous modulo N –counters. Finite state machine-Capabilities and limitations, Mealy and Moore models.

UNIT – V

Programmable Logic Devices, **Threshold Logic**: Basic PLD's-ROM, PROM, PLA, and PLD Realization of Switching functions using PLD's. Capabilities and limitations of threshold gate, Synthesis of threshold functions, Multigate Synthesis.

TEXT BOOKS:

1. Zvi Kohavi & Niraj K. Jha, "Switching and finite automata theory," 3rd edition, Cambridge, 2010.
2. M.Morris Mano, Michael D. Ciletti, "Digital design," Pearson, 4th edition, 2012.

REFERENCES:

1. R. P. Jain, "Modern digital electronics," Tata McGraw-Hill, 3rd edition, 2007.
2. Charles H. Roth, "Fundamentals of logic design," Cengage Learning, 5th edition, 2004.
3. A. Anand Kumar, "Switching theory and logic design," PHI, 2nd edition, 2013.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2230424: SIGNALS AND SYSTEMS

II Year B.Tech. ECE I - Sem.

L	T	P	C
3	1	0	4

Pre-requisites: Basics of Mathematics

Course Objectives:

- Acquire the knowledge of signals and systems
- Understand the behavior of signals in time and frequency domain
- Analyze the characteristics of LTI systems
- Study the concepts of Signals and Systems and its analysis using different Transform techniques
- Obtain the relation between two same signals and two different signals

Course Outcomes:

At the end of this course, students will be able to

- Differentiate various signal functions
- Represent any arbitrary signal in time domain and frequency domain
- Understand the characteristics of linear time invariant systems
- Analyze the signals with different Transform techniques
- Design a system for sampling a signal

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, operations on signals, 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 signals, Fourier Transform of standard signals, Fourier Transform of periodic signals, Properties of Fourier Transform, Fourier Transforms involving impulse function and signum function, Introduction to Hilbert Transform.

UNIT – III

Signal Transmission through Linear Systems: Linear system, Impulse response, Response of a linear system, Linear time invariant(LTI) system, Transfer function of a LTI system, Filter characteristics 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, Convolution and correlation of signals, Concept of convolution in time domain and frequency domain, Graphical representation of convolution

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, and it's Applications.

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, and it's Applications.

UNIT – V

Sampling Theorem: Graphical and analytical proof for band limited signals, Impulse sampling, Natural and flat top sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to band pass sampling.

Correlation: Cross correlation and auto correlation of functions, Properties of correlation functions, Energy density spectrum, Parsevals theorem, Power density spectrum, Relation between autocorrelation function and energy/power spectral density function, Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

TEXT BOOKS:

1. B.P. Lathi, "Signals, Systems & Communications," BSP, 2nd Edition 2001.
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, "Signals and Systems," Pearson India 2nd Edition, 1996.

REFERENCES:

1. Simon Haykin and Van Veen, "Signals and Systems," John Wiley 2nd Edition, 2007.
2. A. Anand Kumar, "Signals and Systems," PHI, 3rd Edition, 2013.
3. Michel J. Robert, "Fundamentals of Signals and Systems," MGH International, 2nd Edition, 2008.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2230425: PROBABILITY THEORY AND STOCHASTIC PROCESSES

II Year B.Tech. ECE I – Sem. **L T P C**
3 0 0 3

Pre-requisite: Knowledge on probability and integration

Course Objectives:

- Learn the basic concepts of probability and its various concepts
- Understand different types of random variables, their density distribution functions and its operations
- Gain knowledge on the functions of two random variables probability density distribution of the joint random variables
- Acquire the knowledge on concepts of the random processes or distribution functions
- Learn the concepts of temporal and spectral characteristics of random process

Course Outcomes:

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

- Solve the simple problems on sample space by using the concepts of probabilities
- Apply the density function concepts in communication systems
- Gain knowledge on multiple random variables; relate the same through examples to practical problems
- Understand the usage of stochastic processes
- Characterize the response of LTI systems driven by a stationary random process

UNIT I

Probability: Probability, Probability introduced through sets and relative frequency, Experiments and sample spaces, Discrete and continuous sample spaces, Events, Probability definitions and axioms, Mathematical model of experiments, Probability as a relative frequency, Joint probability, Conditional probability, Total probability, Bayes' theorem and independent events.

Random Variable: Definition of a random variable, Conditions for a function to be a random variable, Discrete, Continuous and mixed random variables

UNIT II

Distribution & Density Functions: Distribution and density functions and their properties - Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh and conditional distribution, Methods of defining conditional event, Conditional density, and its properties.

Operations on One Random Variable: Introduction, Expected value of a random variable, Moments about the origin, Central moments, Variance and Skew, Chebyshev's inequality, Characteristic function, Moment generating function, Transformations of a random variable.

UNIT III

Multiple Random Variables: Vector random variables, Joint distribution function, Properties of joint distribution, Marginal distribution functions, Conditional distribution and density – Point conditioning, Conditional distribution and density – Interval conditioning, Statistical independence, Sum of two random variables, Sum of several random variables, Central limit theorem (proof not expected).

Operations on Multiple Random Variables: Expected value of a function of random variables: Joint moments about the origin, Joint central moments, Joint characteristic function, Jointly gaussian random variables - two random variables case.

UNIT - IV

Stochastic Processes – Temporal Characteristics: The stochastic process concept, Classification of processes, Deterministic and nondeterministic processes, Distribution and density functions, Concept of stationary and statistical independence, First-order stationary processes, Second- order and wide-sense

stationary, N^{th} order and strict-sense stationary. Time averages and ergodicity, Mean-ergodic processes, Correlation-ergodic processes, Autocorrelation function and its properties, Cross-correlation function and its properties, Covariance and its properties. Linear system response of mean, mean-squared value, Autocorrelation and cross-correlation functions. Gaussian and Poisson random process.

UNIT - V

Stochastic Processes – Spectral Characteristics: The power spectrum: Properties, Relationship between power spectrum and autocorrelation function, Cross-power density spectrum, Properties of PSD, Relationship between cross-power spectrum and cross-correlation function. Spectral characteristics of linear system response: Power density spectrum of linear system response, Cross-power density spectrums of input and output of a linear system.

TEXT BOOKS:

1. Peyton Z. Peebles, “Probability, Random Variables & Random Signal Principles,” TMH, 4^{th} Edition, 2005.
2. Herbert Taub & Donald L Schilling, “Principles of Communication Systems,” Tata McGraw-Hill, 4^{th} Edition, 2013.

REFERENCE BOOKS:

1. Athanasios Papoulis and S. Unnikrishnan Pillai, “Probability, Random Variables and Stochastic Processes,” PHI, 4^{th} Edition, 2002.
2. K. Murugesan, P. Guruswamy, “Probability, Statistics & Random Processes”, Anuradha Agencies, 3^{rd} Edition, 2003.
3. B.P. Lathi, “Signals, Systems & Communications,” B.S. Publications, 3^{rd} Edition, 2003.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2230426: ANALOG AND PULSE CIRCUITS

II Year B.Tech. ECE I – Sem. **L T P C**

3 0 0 3

Pre-requisite: Knowledge on Electronic Devices and Circuits.

Course Objectives:

- To understand the design concepts of multistage amplifiers
- To study the design concepts of transistor amplifiers at high frequency
- To know the concepts of feedback in amplifier circuits
- To design various multi-vibrators using transistors and sweep circuits
- To analyze different types of Oscillators and Large Signal Amplifiers

Course Outcomes:

At the end of this course, students will be able to

- Analyze the different types of amplifiers, operation and its characteristics
- Understand the concepts of feedback in amplifier circuits
- Study different classes of power amplifiers and tuned amplifiers
- Design the concepts of transistor amplifiers at high frequency
- Know about multivibrators for various applications using transistors and sweep circuits

UNIT – I

Multistage Amplifiers: Classification of Amplifiers, BJT AND MOSFET Amplifiers, Differential Amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Frequency response and Analysis of multistage amplifiers, Cascade amplifier, Darlington pair. Transistor at High Frequency: Hybrid – π model of Common Emitter transistor model, f_α, β and Unity gain bandwidth, and Gain bandwidth product.

UNIT – II

Feedback Amplifiers: Concepts of feedback – Classification of feedback amplifiers – General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations.

UNIT – III

Oscillators: Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators, Frequency and amplitude stability of Oscillators, Crystal Oscillator – Operations and Applications.

UNIT – IV

Large Signal Amplifiers: Class A Power Amplifier- Series fed and Transformer coupled, Conversion Efficiency, Class B Power Amplifier- Push Pull and Complimentary Symmetry configurations, Conversion Efficiency, Principle of operation of Class AB and Class C Amplifiers.

Tuned Amplifiers: Single Tuned Amplifiers – Q-factor, Frequency response of tuned amplifiers, Concept of stagger tuning and synchronous tuning.

UNIT – V

Multivibrators: Introduction to Multivibrators, Types of Triggering, Analysis and Design of Bistable, Monostable, A stable Multivibrators and Schmitt trigger using Transistors. Time Base Generators: General features of a Time base Signal, Methods of Generating Time Base Waveform, concepts of Transistor Miller and Bootstrap Time Base Generator, and Methods of Linearity improvement.

TEXT BOOKS:

1. Millman J., Halkias C.C. and Satyabrata Jit, Electronic Devices and Circuits, 3rd edition, Tata McGraw-Hill, 2011.
2. Jacob Millmann and Herbert Taub, “Pulse, Digital and Switching waveforms”, 2nd Edition, Edition, Tata McGraw- Hill publishing company Limited, New Delhi, 2007

REFERENCES:

1. Salivahanan, Suresh Kumar and Vallavaraj, “Electronic Devices and Circuits,” 2nd edition, Tata McGraw-Hill, 2010.
2. Ramakanth A. Gayakwad, “Op-amps and Linear Integrated Circuits”, 3rd Edition, Prentice-Hall of India private Limited, New Delhi, 1995.
3. David A.Bell, “Solid State pulse circuits”, 4th Edition, Prentice-Hall of India Private Limited, New Delhi, 2000.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2230477: DIGITAL SYSTEM DESIGN LABORATORY

II Year B.Tech. ECE I – Sem.

L	T	P	C
0	0	2	1

Course Objectives:

- To acquire the basic knowledge of digital logic levels and to design and verify basic digital electronics circuits
- To introduce to the students the topics that include combinational and sequential circuit analysis and design
- To design optimization methods using random logic gates, multiplexers, decoders, registers, counters

Course Outcomes:

At the end of the laboratory work, students will be able to

- Implements algebraic expressions using logic gates
- Understand the combinational circuits like adder, subtractor, mux, decoder, and encoder
- Design of flip flops & sequential circuits using flip flops

List of Experiments:

1. Realization of Boolean expressions using gates.
2. Design and realization logic gates using universal gates
3. Generation of clock using NAND / NOR gates.
4. Design a 4 – bit adder/subtractor.
5. Design and realization of a 4-bit gray to binary and binary to gray Converter.
6. Design and realization of an 8-bit parallel load and serial out shift register using flip-flops.
7. Design and realization of a synchronous and asynchronous counter using flip-flops.
8. Design and realization of 8x1 MUX using 2x1 MUX.
9. Design and realization of 4-bit comparator.
10. Design a Ring counter and Twisted ring counter using a 4-bit shift register
11. Design and Realization of a sequence detector-a finite state machine.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2230478: BASIC SIMULATION LABORATORY

II Year B.Tech. ECE I – Sem. **L T P C**

0 0 2 1

Course Objectives:

- To introduce MATLAB and use it as a computation and visualization tool
- To expose the applications of signal analysis

Course Outcomes:

At the end of the laboratory work, students will be able to

- Generate various signals and will be able to perform various operations on signals and also classify the random process characteristics
- Apply Laplace and Fourier transforms of a signal and also analyze its frequency response

LIST OF EXPERIMENTS:

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Convolution for Signals and sequences.
6. Auto Correlation and Cross Correlation for Signals and Sequences.
7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
8. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realiazability and stability properties.
9. Gibbs Phenomenon Simulation.
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform Synthesis using Laplace Transform.
12. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function.
13. Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew, Kurtosis, and PSD, Probability Distribution Function.
14. Verification of Sampling Theorem.
15. Removal of noise by Autocorrelation / Cross correlation.
16. Extraction of Periodic Signal masked by noise using Correlation.
17. Verification of Weiner-Khinchine Relations.
18. Checking a Random Process for Stationarity in Wide sense.

Note:

- All the experiments are to be simulated using MATLAB or equivalent software
- Minimum of 15 experiments are to be completed

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2230479: ANALOG AND PULSE CIRCUITS LABORATORY

II Year B.Tech. ECE I – Sem. **L T P C**

0 0 2 1

Course Objectives:

- Analyze single stage and multi stage amplifiers
- Design the feedback amplifiers and oscillators through simulation.
- Find the frequency response of Power Amplifiers
- Implementation of circuits for linear and nonlinear wave shaping
- Measure the characteristics of different multivibrators

Course Outcomes:

At the end of the laboratory work, students will be able to

- Determine the frequency of oscillations – Hartley oscillator and Colpitts oscillator RC phase shift oscillator and Wein Bridge Oscillator
- Calculate the bandwidth of power amplifiers
- Design and analyze all multivibrator circuits
- Design and analyze Schmitt trigger
- Demonstrate about the output waveforms of Miller Sweep Circuit and Bootstrap Time Base Generator

LIST OF EXPERIMENTS:

Experiments marked with * has to be designed, simulated and verify in hardware laboratory.

1. Two Stage RC Coupled Amplifier **(*)**.
2. Cascade Amplifier circuit / Darlington Pair circuit **(*)**.
3. Current Shunt Feedback Amplifier **(*)**.
4. Voltage Series Feedback Amplifier **(*)**.
5. RC Phase Shift Oscillator using Transistors **(*)**.
6. Hartley and Colpitts's Oscillator circuit **(*)**.
7. Class A Power Amplifier (Transformer less) **(*)**.
8. Class B Complementary Symmetry Amplifier **(*)**.
9. Single Tuned Amplifier circuit **(*)**.
10. Monostable Multivibrator **(*)**.
11. Bistable Multivibrator **(*).**
12. Astable Multivibrator **(*)**.
13. Schmitt Trigger using transistor **(*)**.
14. Verify the output characteristics of Miller Sweep Circuit.
15. Verify the output characteristics of Bootstrap Time Base Generator.

NOTE: Minimum of 12 experiments to be conducted.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2230022: GENDER SENSITIZATION LAB
(An Activity-based Course)

II Year B.Tech. ECE I – Sem. **L T P C**

3 0 0 0

COURSE DESCRIPTION

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality.

This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Course Objectives:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Learning Outcomes:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that

provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

UNIT - I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

UNIT – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences- Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

UNIT – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. - Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

UNIT – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*
Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life"

UNIT – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals
Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks- The Brave Heart.

Note: **Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.**

- ***Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to thetopics given in the syllabus on "Gender".***

ESSENTIAL READING: The Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender" written* by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu **published by Telugu Akademi, Telangana Government in 2015.**

ASSESSMENT AND GRADING:

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2240016: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

II Year B.Tech. ECE II – Sem. **L T P C**
3 0 0 3

Course Objective:

- To learn the basic Business types, impact of the economy on business and firms specifically.
- To analyze the business from the financial perspective.

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

- Understand the various forms of business and the impact of economic variables on the business.
- Understand the demand, supply, production, cost, market structure, pricing aspects
- Study the firm's financial position by analyzing the financial statements of a company.

UNIT – I: Introduction to Business and Economics

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT – II: Demand and Supply Analysis

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT – III: Production, Cost, Market Structures & Pricing

Production Analysis: Factors of Production, Production Function, Production Function with onevariable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly,Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume ProfitAnalysis.

UNIT – IV: Financial Accounting:

Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

UNIT – V: Financial Analysis through Ratios:

Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).Introduction to Fund Flow and Cash Flow Analysis (simple problems).

TEXT BOOKS:

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, InternationalBook House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGrawHill Education Pvt. Ltd. 2012.

REFERENCE BOOKS:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, VikasPublications, 2013.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2240427: ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

II Year B.Tech. ECE II – Sem. **L T P C**
2 1 0 3

Pre-requisite: Knowledge on Vector calculus

Course Objectives:

- Familiarize about 3D vector co-ordinate systems and electromagnetic field concepts
- Have skills in selecting appropriate Maxwell's equations in electromagnetic theory for a given application and analyze the problem
- Investigate the propagation characteristics of electromagnetic waves at boundary of different media
- Demonstrate the ability to compute various parameters for transmission lines using smith chart and classical theory
- To calculate various line parameters by conventional and graphical methods

Course Outcomes:

At the end of this course, the students are able to

- Understand the characteristics of electrostatics and magnetostatics for wave propagation
- Study time varying Maxwell's equations and their applications in electromagnetic problems
- Demonstrate the reflection and refraction of EM waves at boundaries
- Analyze basic transmission line parameters at various conditions
- Show how waves propagate in dielectrics and lossy media

UNIT – I

Electrostatics: Coulomb's law, Electric field intensity, Fields due to different charge distributions; Electric flux density, Gauss law and its applications; Scalar electric potential; Energy density, Illustrative problems; Conductors and dielectrics-characterization; Convection and conduction currents; Dielectric constant, isotropic and homogeneous dielectrics; Continuity equation and relaxation time, conductivity, power absorbed in conductor, Poisson's and Laplace's equations; Capacitance: Parallel plate, Co axial, Spherical capacitors; Illustrative problems

UNIT – II

Magnetostatics: Biot-savart law; Ampere's circuital law and applications; Magnetic flux density; Magnetic scalar and vector potentials; Forces due to magnetic fields; Ampere's force law; Boundary conditions: Dielectric- dielectric, Dielectric conductor interfaces; Inductances and magnetic energy; Illustrative problems; Maxwell's equations (Time varying fields): Faraday's law; Inconsistency of ampere's law for time varying fields and definition for displacement current density; Maxwell's equations in differential form, Integral form and word statements

UNIT – III

Uniform Plane Waves: Wave equations for conducting and perfect dielectric media; Relation between E and H; Wave propagation in lossless and conducting media, Loss tangent, Intrinsic impedance; Skin depth; Polarization, Illustrative problems

Reflection/Refraction of Plane Waves: Reflection and refraction at normal incidence, Reflection and refraction at oblique incidence; Standing waves; Brewster angle, Critical angle, Total internal reflection, Surface impedance; Poynting vector and poynting theorem-applications; Power loss in plane conductor; Illustrative problems

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

UNIT – IV

Transmission Lines Characteristics: Transmission line characteristics: Types; Transmission line parameters; Transmission line equations; Characteristic impedance, propagation constant; Phase and group velocities; Infinite line concepts, Loss less /low loss transmission line characterization; Condition for distortion less and minimum attenuation in transmission lines; Loading: Types of loading; Illustrative problems

UNIT – V

UHF Transmission Lines and Applications: Input impedance relations; SC and OC lines; Reflection coefficient, VSWR; UHF lines as circuit elements, $\lambda/4$, $\lambda/2$ and $\lambda/8$ lines, impedance transformations, significance of Z_{min} and Z_{max}; Smith chart: Configuration and applications, Illustrative problems.

TEXT BOOKS:

1. E.C. Jordan, K.G. Balmain, “Electromagnetic waves and Radiating Systems,” PHI 2nd Edition, 2000.
2. Matthew N.O. Sadiku, “Elements of Electromagnetics,” Oxford University Press, 4th Edition, 2009.

REFERENCES:

1. William H. Hayt Jr., John A. Buck, “Engineering electromagnetic,” Tata McGraw Hill, 7th Edition, 2006.
2. Nathan Ida, “Engineering Electromagnetic,’’ Springer (India) Pvt. Ltd, 2nd Edition, 2005
3. G. Sashibushana Rao, “Electromagnetic field theory and Transmission lines,’’ Wiley (India) 1st Edition, 2013.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2240428: ANALOG AND DIGITAL COMMUNICATIONS

II Year B.Tech. ECE II – Sem. **L T P C**

2 1 0 3

Pre-requisite: Knowledge on Signals and Fourier Transforms.

Course Objective:

- Develop ability to analyze system requirements of analog and digital communication systems
- Design the generation and detection of various analog and digital modulation techniques
- Acquire theoretical knowledge of each block in AM/FM transmitters and receivers
- Understand the concepts of baseband transmissions and various source & channel coding techniques
- Study of various noise sources and SNR/Figure of Merit calculations

Course Outcome:

At the end of this course, the students will be able to

- Understand the basic knowledge of AM Transmission & Reception
- Acquire the basic knowledge of FM Transmission & Reception
- Analyze the error performance of digital modulation techniques
- Conceptually develop the baseband signal & system transmission model
- Design of typical conventional telecommunication system that consists of basic and essential building blocks

UNIT– I

Amplitude Modulation: Significance of modulation, Amplitude Modulation - Time and frequency domain description, power relations in AM waves, Generation of AM waves -Switching modulator, Detection of AM signal - Envelope detector, Generation of DSBSC signal - Balanced Modulators, Detection of DSB-SC Modulated signal, SSB modulation, Frequency discrimination and Phase discrimination methods, Demodulation of SSB signal, Vestigial side band modulation. AM receivers-tuned radio frequency and super heterodyne receivers.

UNIT – II

Angle Modulation: Introduction to Angle Modulation, Frequency Modulation - Narrow band FM and Wide band FM, bandwidth calculations, constant average power, FM signal generation- Armstrong method, Detection of FM Signal- balanced slope detector, Phase locked loop, Concepts of phase modulation, Comparison of AM, FM and PM, Pre-emphasis and de-emphasis. FM receiver, Comparison of TDM and FDM.

UNIT – III

Introduction to Digital Communications: Block diagram of digital communication system, advantages of digital communication systems, digital representation of analog signals.

Baseband Data Transmission: Introduction**,** sampling process, PAM, PWM, PPM, pulse code modulation, differential pulse code modulation, delta modulation, ADM, noise considerations in PCM and DM. Inter symbol Interference, Nyquist criterion for zero ISI, eye diagrams, probability of error, optimum receiver, matched filter receiver.

UNIT– IV

Passband Data Transmission: Amplitude shift keying, Frequency shift keying, and Phase shift keying, ASK generation and detection, FSK generation and detection, PSK generation and detection, DPSK generation and detection, M-ary schemes- QAM and QPSK. Probability of error of ASK, FSK, and PSK.

UNIT– V

Noise, Information Theory and Coding: Types of noise, Gaussian and white noise characteristics, resistive/thermal noise, narrow band noise- In-phase and quadrature representation and its properties. noise in AM and FM systems, SNR and figure of merit calculations.

Information Theory and Coding: Entropy, mutual information, channel capacity theorem, trade of between bandwidth and SNR, source coding: Shannon fano coding and Huffman coding, channel coding – linear block code and hamming codes, fundamentals of error detection and correction codes.

TEXT BOOKS:

1. Simon Haykin, “Analog and digital communications,” John Wiley, 4th edition 2005.
2. Sudakshina Kundu, “Analog and digital communications,” Pearson India, 1st edition 2010.

REFERENCES:

1. Herbert Taub, Donald L Schiling, Goutam Saha, “Principles of communication systems,” Mcgraw- Hill, 3rd edition, 2008.
2. Dennis Roddy and John Coolean, “Electronic communications,” PEA, 4th Edition, 2004.
3. Wayne Tomasi, “Electronics communication systems,” PHI, 5th edition, 2009.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2240429: LINEAR AND DIGITAL IC APPLICATIONS

II Year B.Tech. ECE II – Sem. **L T P C**

3 0 0 3

Pre-requisites: Knowledge on Basic Electrical Engineering and Semiconductor Devices

Course Objectives:

- Understand the basic building blocks of linear integrated circuits
- Theoretical aspects and applications of multivibrators and voltage regulators
- Analyze the concepts of active filters and PLL
- Development of A/D and D/A converters
- Design and analysis of the various combinational and sequential circuits

Course Outcomes:

At the end of this course, students will be able to

- Learn the characteristics of Op-Amp and integrated circuits
- Know the applications of Op-Amp
- Analyze the various operations of active filters and PLL
- Design the A/D and D/A conversion techniques
- Gain knowledge about various combinational and sequential circuits

UNIT– I

Integrated Circuits and Operational Amplifier: Introduction, Classification of IC's, IC chip size and circuit complexity, basic concepts of Op-Amp IC741 Op- Amp and its features, the ideal Op-Amp, Op-Amp internal circuit, Op-Amp characteristics - DC and AC analysis. Inverting and non-inverting amplifiers, adder, subtractor, Instrumentation amplifier, AC amplifier, V to I and I to V converters, Integrator and differentiator, Sample and Hold circuit, Log and Antilog amplifier, multiplier and divider, Comparators, Schmitt trigger and Multivibrators.

UNIT – II

Applications of Op-Amp: Triangular and Square waveform generators, Oscillators types and principle of operation –RC, Wein and Quadrature type, IC Voltage Regulators, IC 723 general purpose regulators, Introduction, Butterworth filters – 1st order, 2nd order low pass and high pass filters, band pass, band reject and all pass filters.

IC-555 & IC-565 Timer Applications: Introduction to IC 555 timer, description of functional diagram, monostable, Astable operations and applications, Schmitt trigger, PLL, Principles and description of individual blocks of 565.

UNIT – III

A/D and D/A Converters: Introduction, basic DAC techniques, D/A converter – specifications - weighted resistor type, R-2R Ladder DAC, A/D Converters – specifications – Counter type, Flash type - Successive Approximation type - Single Slope type – Dual Slope type ADC.

UNIT – IV

Digital Integrated Circuits: Classification of Integrated Circuits, Comparison of Various Logic Families, Combinational Logic ICs –Specifications and Applications of TTL-74XX & Code Converters, Decoders, Demultiplexers, 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. Ramakanth A. Gayakwad, “Op-Amps & Linear ICs,” PHI, 4th Edition, 2003.
2. Floyd and Jain, “Digital Fundamentals,” Pearson Education, 11th Edition, 2010.

REFERENCES:

1. D. Roy Chowdhury, “Linear Integrated Circuits,” New Age International (p) Ltd, 11th Edition, 2018.
2. K. Lal Kishore, “Operational Amplifiers with Linear Integrated Circuits,” Pearson, 2nd Edition, 2009.
3. S. Salivahanan, “Linear Integrated Circuits and Applications,” Tata McGraw-Hill Education, 3rd Edition, 2018.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2240503: PYTHON PROGRAMMING
(Common to All Branches)

II Year B.Tech. ECE II – Sem.

L	T	P	C
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Course Outcomes:

. The students should be able to

- Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
- Create, run and manipulate Python Programs using core data structures like Lists,
- Dictionaries.
- Demonstrate proficiency in handling Exceptions and File Systems.
- Write Programs using Functions and Modules
- Develop programs using graphical user interface.

UNIT - I

Python Basics

Python Objects: Standard Types, Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types.

Python Numbers: Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions.

UNIT - II

Conditionals and Loops-if, else, elif, for, while, break, continue, pass, List comprehensions, Generator expressions.

Sequences: Strings, Lists, and Tuples- Built-in Functions, Special features.

Mapping and Set Types: Dictionaries, Sets- Built-in Functions.

UNIT-III

Files and Input / Output: File Objects, File Built-in Functions, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules.

Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Exceptions and the sys Module.

UNIT-IV

Functions and Functional Programming –Calling Functions , Creating Functions, Passing Functions , Formal Arguments, Variable-Length Arguments, Functional Programming.

Modules–Modules and Files, Namespaces, Importing Modules, Module Built-in Functions, Packages, Related modules

UNIT – V

Multithreaded Programming: Introduction, Threads and Processes, Python Threads, the Global Interpreter Lock, Thread Module, Threading Module.

GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs.

TEXT BOOKS:

1. Core Python Programming, Wesley J. Chun, Second Edition, Prentice Hall PTR.

REFERENCE BOOKS:

1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, VamsiKurama, Pearson
4. Learning Python, Mark Lutz, O'Really.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
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2240480: ANALOG AND DIGITAL COMMUNICATIONS LABORATORY

II Year B.Tech. ECE II – Sem.

L	T	P	C
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Pre-requisites: Basic concepts of analog and digital communications

Course Objectives:

- Implement various analog & digital modulation techniques in communications
- Study of various spectrums of analog modulation systems using spectrum analyzer
- Understand the importance of automatic gain control and Phase locked loop
- Explore receiver characteristics in analog & digital communications
- Observe the performance of typical telecommunication system in presence of noise

Course Outcomes:

At the end of the laboratory work, the students are able to:

- Analyze different modulation & demodulation techniques used in communication system and implement the same using Hardware
- Design pre-emphasis and de-emphasis circuits used in frequency modulation
- Understand the concept of PLL, Digital phase detector and synchronous detector and implement the same using hardware
- Distinguish between NBFM and WBFM signals using Hardware
- Apply ASK, FSK, PSK, PCM, DPCM modulation scheme on a digital signal, modulate the message signal with carrier signal

List of Experiments:

1. Amplitude modulation: Generation and detection.
2. Double sideband modulation: Generation and detection.
3. Single modulation (phase shift method): Generation and detection.
4. Frequency modulation: Generation and detection.
5. Study of spectrum analyzer using AM/FM signals.
6. Design & Implementation of pre-emphasis & de-emphasis filters.
7. Time division multiplexing & de-multiplexing of any two band limited signals.
8. Verification of sampling theorem.
9. Pulse amplitude modulation: Generation and detection.
10. Pulse code modulation: Generation and detection.
11. Differential pulse code modulation: Generation and detection.
12. Delta modulation: Generation and detection.
13. Amplitude shift keying: Generation and detection.
14. Frequency shift keying: Generation and detection.
15. Phase shift keying: Generation and detection.

NOTE: Minimum of 12 experiments to be conducted.

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2240481: LINEAR AND DIGITAL IC APPLICATIONS LABORATORY

II Year B.Tech. ECE II – Sem.

L	T	P	C
0	0	2	1

Pre-requisites: Basic concepts of linear and digital IC applications

Course Objectives:

- Know the characteristics of op-amp
- Study the filter characteristics using IC741
- Learn the operation of IC 555
- Design combinational circuits using ICs
- Implement the sequential circuits using ICs

Course Outcomes:

At the end of the laboratory work, students will be able to

- Identify the terminals of IC 741 and IC 555
- Understand the applications of IC 741 & IC 555
- Analyze the various filter circuits using IC741
- Implement combinational circuits using ICs
- Design the sequential circuits using ICs

List of Experiments:

1. Adder and Subtractor using Op Amp
2. Comparators using Op Amp.
3. Integrator and differentiator Circuits using IC 741.
4. Active Filter Applications –LPF, HPF (first order)
5. IC 741 Waveform Generators –Sine, Square wave and Triangular waves.
6. Mono-stable Multivibrator using IC 555
7. Three Terminal Voltage Regulators –7805, 7809, 7912
8. Design a 16-bit comparator using 4-bit Comparators.
9. Design a 450 KHz clock using NAND / NOR gates.
10. Design a 4-bit pseudo random sequence generator using 4 –bit ring counter.
11. Design a 16 x 1 multiplexer using 8 x 1 multiplexer.
12. Plot the transform Characteristics of 74H, LS, HS series IC's.
13. Design a 4 –bit Gray to Binary and Binary to Gray Converter
14. Design a Ring counter and Twisted ring counter using a 4-bit shift register
15. Design a 4-digit hex counter using synchronous one-digit hex counters.

NOTE: Minimum of 12 experiments to be conducted.

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2240573: PYTHON PROGRAMMING LABORATORY
(Common to All Branches)

II Year B.Tech. ECE II – Sem.

L	T	P	C
0	0	2	1

Course Outcomes:

. The students should be able to

- Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
- Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries .
- Demonstrate proficiency in handling Exceptions and File Systems.
- Write Programs using Functions and Modules
- Develop programs using Graphical user interface.

Exercise 1 –Python Numbers

a) Write a program to determine whether a given year is a leap year, using the following formula: a leap year is one that is divisible by four, but not by one hundred, unless it is also divisible by four hundred. For example, 1992, 1996, and 2000 are leap years, but 1967 and 1900 are not. The next leap year falling on a century is 2400.

b) Write a program to determine the greatest common divisor and least common multiple of a pair of integers.

c) Create a calculator application. Write code that will take two numbers and an operator in the format: N1 OP N2, where N1 and N2 are floating point or integer values, and OP is one of the following: +, -, *, /, %, **, representing addition, subtraction, multiplication, division, modulus/remainder, and exponentiation, respectively, and displays the result of carrying out that operation on the input operands.
Hint: You may use the string split() method, but you cannot use the exal () built-in function.

Exercise –2 Control Flow

a) Write a Program for checking whether the given number is a prime number or not.
b) Write a program to print Fibonacci series upto given n value.
c) Write a program to calculate factorial of given integer number.

Exercise 3 Control Flow -Continued

a) Write a program to calculate value of the following series 1+x-x2+x3-x4+----xn.
b) Write a program to print pascal triangle.

Exercise 4 – Python Sequences

a) Write a program to sort the numbers in ascending order and strings in reverse alphabetical order.

b) Given an integer value, return a string with the equivalent English text of each digit. For example, an input of 89 results in "eight-nine" being returned. Write a program to implement it.

Exercise 5– Python Sequences

a) Write a program to create a function that will return another string similar to the input string, but with its case inverted. For example, input of "Mr. Ed" will result in "mR.eD" as the output string.

b) Write a program to take a string and append a backward copy of that string, making a palindrome.

Exercise 6– Python Dictionaries

a) Write a program to create a dictionary and display its keys alphabetically.

b) Write a program to take a dictionary as input and return one as output, but the values are now the keys and vice versa.

Exercise - 7 Files

a) Write a program to compare two text files. If they are different, give the line and column numbers in the files where the first difference occurs.

b) Write a program to compute the number of characters, words and lines in a file.

Exercise - 8 Functions

a) Write a function ball collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

b) Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

c) If (distance between two balls centers) <= (sum of their radii) then (they are colliding)

d) Find mean, median, mode for the given set of numbers in a list.

e) Write simple functions max2() and min2() that take two items and return the larger and smaller item, respectively. They should work on arbitrary Python objects. For example, max2(4, 8) and min2(4, 8) would each return 8 and 4, respectively.

Exercise - 9 Functions - Continued

a) Write a function nearlyequal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.

b) Write a function dups to find all duplicates in the list.

c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

a) Write a function cumulative_ product to compute cumulative product of a list of numbers.

b) Write a function reverse to reverse a list. Without using the reverse function.

c) Write function to compute GCD, LCM of two numbers. Each function shouldn't exceed one line.

Exercise - 11 GUI, Graphics

a) Write a GUI for an Expression Calculator usingtk

b) Write a program to implement the following figures using turtle

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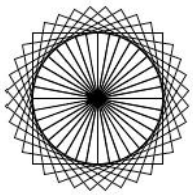
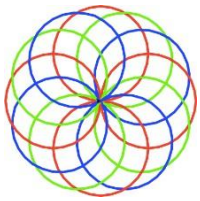

TEXT BOOKS:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

REFERENCE BOOKS:

1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, VamsiKurama, Pearson
4. Learning Python, Mark Lutz, O'Really.

MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

2240023: CONSTITUTION OF INDIA

II Year B.Tech. ECE II – Sem. **L T P C**

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The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the “basic structure” of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of “Constitutionalism” – a modern and progressive concept historically developed by the thinkers of “liberalism” – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of “constitutionalism” in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India’s legacy of “diversity”. It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be “static” and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it “as one of the strongest court in the world”.

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India

9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21