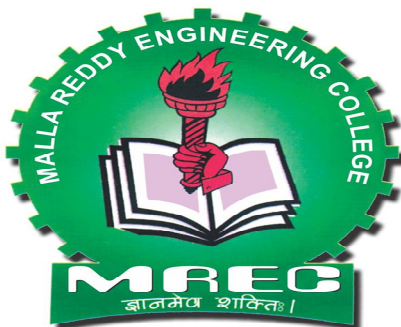# ACADEMIC REGULATIONS

For

B. Tech. Four Year Degree Programme

(MR24 Regulations)

Effective from the Academic Year 2024-25 onwards

MALLA REDDY ENGINEERING COLLEGE
(Autonomous)

(An UGC Autonomous Institution, Approved by AICTE and Affiliated to JNTUH, Hyderabad)

Recognized under section 2(f) &12 (B) of UGC Act 1956, Accredited by NAAC with 'A++' Grade (III Cycle)

Maisammaguda, Dhulapally (Post Via Kompally), Secunderabad - 500 100.

Website: www.mrec.ac.in   E-mail: principal@mrec.ac.in

MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

MR24 – ACADEMIC REGULATIONS (CBCS)
for B.Tech. (REGULAR) DEGREE PROGRAMME

Applicable for the students of B.Tech. (Regular) programme admitted from the Academic Year *2024-25* onwards

The B.Tech. Degree of Jawaharlal Nehru Technological University Hyderabad, Hyderabad shall be conferred on candidates who are admitted to the programme and who fulfill all the requirements for the award of the Degree.

VISION OF THE INSTITUTE

To be a premier center of professional education and research, offering quality programs in a socio-economic and ethical ambience.

MISSION OF THE INSTITUTE

- To impart knowledge of advanced technologies using state-of-the-art infrastructural facilities.

- To inculcate innovation and best practices in education, training and research.

- To meet changing socio-economic needs in an ethical ambience.

PROGRAMME OUTCOMES (POs)

PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

1. **Malla Reddy Engineering College (Autonomous)** offers **Four** Years (**Eight** Semesters) **Bachelor of Technology** (**B.Tech**.) with Choice Based Credit System (CBCS) in the following Branches of Engineering with effect from the academic year **2024-25**.

S. No.	Branch Code	Branch	Intake
1	01	Civil Engineering (CE)	30
2	02	Electrical and Electronics Engineering (EEE)	60
3	03	Mechanical Engineering (ME)	30
4	04	Electronics and Communication Engineering (ECE)	180
5	05	Computer Science and Engineering (CSE)	480
6	12	Information Technology (IT)	180
7	67	Computer Science and Engineering (Data Science)	240
8	66	Computer Science and Engineering (AI &ML)	240

2. Eligibility for Admission

2.1 Admission to the B.Tech programme shall be made either on the basis of the merit rank obtained by the qualifying candidate in entrance test conducted by the Telangana State Government (TSEAMCET) or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government of Telangana from time to time.

2.2 The medium of instructions for the entire B.Tech programme will be **English** only.

3. B.Tech. Programme Structure & Duration of Study

3.1 A student after securing admission shall pursue the B.Tech programme in a minimum period 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. Further 2 years of extension is allowed for appearing examinations, failing which student shall forfeit seat in B.Tech. Course. The total credits for the entire B.Tech. programme is 160 as prescribed by AICTE. Each student shall secure 160 credits (with CGPA $\geq$ 5) required for the completion of the B.Tech 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 as listed below.

3.2.1 Semester Scheme:

Each B.Tech programme is of 4 academic years (8 Semesters), with the academic year being divided into two semesters of 22 weeks ($\geq$90 instructional days) each, having **'Continuous Internal Evaluation (CIE)'** and **'Semester End Examination (SEE)'** under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC. The Curriculum/ Course Structure is defined based on the model curriculum defined by AICTE.

3.2.2 Credit Courses:

All Subjects/ Courses are to be registered by a student in a semester to earn credits. Credits shall be assigned to each Subject/ Course in a 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 (T).

• One Credit - for two hours/ Week/ Semester for Laboratory/ Practical's (P) courses.

Courses like Environmental Sciences, Induction Programme, Constitution of India, Intellectual Property Rights, Gender Sensitization and students' activities like Internship are identified as Mandatory/Audit courses. These courses will not carry any credits.

3.2.3 Subject/ Course Classification:

All subjects/ courses offered for the B.Tech. Programmes are broadly classified as follows.

(a) Foundation Courses (FC)
(b) Core Courses (CC)
(c) Elective Courses (EC)
(d) Mandatory Courses (MC)
(e) Audit Courses (AC)

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FC)	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 (CC)	PC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.
5	Elective Courses (EC)	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) |

3.2.4 Course Nomenclature:

The curriculum nomenclature or course structure grouping for each of the B.Tech. Programmes, is as listed below (along with AICTE specified range of total credits).

S. No.	Broad Course Classification	Course Group or Category	Course Description	Total Credits
1	Foundation Courses	Humanities, Social sciences & Management (HSM)	English, humanities, social sciences, management	12
		Basic Sciences (BS)	Mathematics, Physics, Chemistry.	23
		Engineering Sciences (ES)	Fundamental Engineering Courses	22
2	Core Courses and Core activities	Program Core (PC)	Professional courses-core relevant to the discipline	57
		Project work (PW)	Minor & Major project (Institute / Industry), Internship (Industry/ research organization), Seminar.	16
3	Elective Courses	Program Electives (PE)	Professional courses-electives relevant to the discipline	18
		Open Electives (OE)	Electives from other departments and or emerging areas	12
4	Mandatory Courses	Mandatory Courses (MC)	Courses on Environmental Science and Rural Sensitization, Gender Sensitization, Constitution of India, Intellectual Property Rights	No Credits
Total Credits				160

4.0 Course Registration

4.1 A 'Faculty Advisor or Counselor' shall be assigned a group of 20 students, who will advise the students on the Under Graduate Programme (UGP), its Course Structure and Curriculum, Choice / Option for Subjects / Courses, based on his competence, progress, pre-requisites and interest.

4.2 Academic section of the College invites 'Registration Forms' from students within 15 days from the commencement of class work for the semester.

4.3 If the student submits ambiguous choices or multiple options or erroneous entries during 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.

4.4 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.

4.5 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.

4.6 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 for an Open Elective subject offered by his own (parent) department, if the student has not registered 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.

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

4.8 For Audit Courses a **'Satisfactory Participation Certificate'** from the authorities concerned for the relevant semester is essential. No Marks or Credits shall be awarded for these activities.

4.9 For Mandatory Courses, a '**Satisfactory / Not Satisfactory' is** awarded based on the performance in Continuous Internal Evaluation (CIE).

5.0 Elective Subjects/ Courses to be offered

5.1 An Elective Subject/ Course may be offered to the students, ONLY IF a minimum of 40 students opt for the same. The maximum strength of a section is limited to75.

5.2 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.

5.3 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 he / she acquire a minimum of 75% of attendance in aggregate of all the Subjects/ Courses (including Non-Credit Courses) 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 Condoning of shortage of attendance in aggregate up to 10% (>= 65% and< 75%) in each semester may be granted by the Academic Cell on genuine and **valid grounds** based on the student's representation with supporting evidence.

6.3 A stipulated fee prescribed by the College Academic Committee (CAC), shall be payable towards condoning of shortage of attendance.

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

6.5 Students whose attendance is < 65% are not eligible to register for Semester End Examinations, 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 he got detained, by seeking re-admission for that semester as and when offered; in case 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 If any student fulfills the attendance requirement in the present semester shall not be eligible for readmission into the same semester.

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) in the Continuous Internal Evaluation (CIE), not less than 35% (21 marks out of 60 marks) in the semester end examinations (SEE), and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades, this implies securing 'P' Grade or above in that Subject/ Course. If the student secured 'F' grade in any subject he/she can apply for recounting / revaluation by paying prescribed fee. If the student is not satisfied after the results declaration of recounting / revaluation he/she can apply for challenge valuation with the prescribed fee. College appoints a faculty member; student can bring another faculty member who taught the respective subject at least once (proof should be provided). The faculty member should be from any autonomous college affiliated to JNTUH or JNTUH constituent colleges.

7.2 A student shall be deemed to have satisfied the Academic Requirements and earned the credits allotted to to Real-time Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship (or) Seminar, if he/ she secure not less than 40% marks (i.e 40 out of 100 allotted marks) in each of them. The student would be treated as failed, if he/ she :

(i) does not submit a report on his/ her Mini Project / Seminar / Project or does not make a presentation of the same before the Evaluation Committee as per schedule or (ii) secures less than 40% of marks in Mini Project/ Seminar/ Project evaluations.

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

7.3 Promotion Rules: Every student has to fulfil the Attendance and Academic requirements by securing the required credits against registered credits as shown below:

S. No.	Promotion	Conditions to be fulfilled
1.	First year first semester (I Semester) to first year second semester (II Semester)	• Regular course of study of first year first semester. (I Semester)
2.	First year second semester (II Semester) to second year first semester (III Semester)	• Regular course of study of first year second semester (II Semester). • Must have secured at least 50% credits up to first year second semester (II Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3.	Second year first semester (III Semester) to second year second semester (IV Semester)	• Regular course of study of second year first semester (III Semester)
4.	Second year second semester (IV Semester) to third year first semester (V Semester)	• Regular course of study of second year second semester (IV Semester). • Must have secured at least 60% credits up to second year second semester (IV Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5.	Third year first semester (V Semester) to third year second semester (VI Semester)	• Regular course of study of third year first semester (V Semester).

6.	Third year second semester (VI Semester) to fourth year first semester (VII Semester)	• Regular course of study of third year second semester (VI Semester). • Must have secured at least 60% credits up to third year second semester (VI Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7.	Fourth year first semester (VII Semester) to fourth year second semester (VIII Semester)	• Regular course of study of fourth year first semester (VII Semester).

7.4 A Student shall register for all subjects covering 160 credits as specified and listed (with the relevant Course/ Subject Classifications as mentioned) in the Course Structure, fulfils all the Attendance and Academic requirements for 160 credits securing a minimum of 'P' Grade (Pass Grade) or above in each subject and earn 160 credits securing SGPA $\geq$ 5.0 (in each semester) and CGPA (at the end of each successive semester) $\geq$ 5.0, to successfully complete the B.Tech Programme (including all mandatory courses). 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 some more **'Extra Subjects'** (in the parent Department or other Departments/ Branches of Engineering) other than those listed subjects totaling to 160 credits as specified in the Course Structure of his/ her 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 taken into account while calculating the SGPA and CGPA. For such extra subjects registered, Letter Grade alone will be indicated in the Grade Card, as a performance measure, subject to completion of the Attendance and Academic Requirements as stated in items No.6 and 7.1 to7.4.

7.6 A student eligible to appear in the Semester End Examination in any Subject/ Course, but absent from it or failed (thereby failing to secure 'P' Grade or above) may reappear for that Subject/ Course at the supplementary examination as and when conducted. In such cases, his / her Internal Marks (CIE) assessed earlier for that Subject/ Course will be carried over and added to the marks to be obtained in the SEE supplementary examination, for evaluating his/ her performance in that subject.

7.7 When a student is detained due to shortage of attendance in any semester, he/ she may be re-admitted when the same semester is offered in the next academic year for fulfillment of academic requirements. The academic regulations under which student has been readmitted shall be applicable. However, no Grade Allotments or SGPA/ CGPA calculations will be done for that entire semester in which he/ she got detained.

7.8 When a student is detained due to lack of credits in any year, shall be promoted to the next academic year only after acquiring the required academic credits. The

academic regulations under which student has been readmitted shall be applicable to him.

8.0 Evaluation, Distribution and Weightage of Marks

8.1.1 The performance of a student in each semester shall be evaluated subject - wise (irrespective of credits assigned) for 100 marks for Theory, Practicals, Seminar, Drawing / Design, Mini Project, Project and Minor Courses etc. The Theory / Practical courses are evaluated with two components.

1. Continuous Internal Evaluation (CIE),
2. Semester End Examination (SEE).
The distribution of 40 Marks for CIE and 60 Marks for SEE.

8.2 Theory Courses:

8.2.1 Continuous Internal Evaluation (CIE):

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

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 paper for 10 marks.
   b. Part - B : Descriptive paper for 20 marks.

Mid - Term Examination – UG				
Part	Type of Questions	No. of Questions	Marks per Question	Total
Part - A	Multiple – Choice Questions	20	0.5	10
Part - B	Internal choice questions (Module-wise)	5	4	20
Mid Term Exam Total				**30**

The average of the two Mid Term Examinations shall be taken as the final marks for Mid Term Examination (for 30 marks).

The remaining 10 marks of Continuous Internal Evaluation 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.

The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus. First Assignment should be submitted before the conduct of the first mid-term examinations, and the Second Assignment should be submitted before the conduct of the second midterm examinations. 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 weightage for the midterm examination shall be given as average of both mid-term examinations. The student shall appear for both midterm examinations, in case of any specific reason the student appears only one midterm examination, 50% weightage of that examination shall be considered.

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 Over all 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.

A student who has failed to secure 35% of CIE marks in a subject, 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.

A student shall be given only one time chance to re-register for a maximum of two subjects in a semester:
- *If the internal marks secured by a student in the Continuous Internal Evaluation marks for 40 (Sum of 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 classwork 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.

8.2.2 Semester End Examination (SEE):
Semester End Examination (SEE) shall be conducted for all courses of B.Tech Programmes at the end of the Semester. Duration of the examination is 3 hours. The paper setting and evaluation of all courses carried out by external examiners. The examiners will be selected by the Chief Controller of Examinations/Principal, from the panel of examiners submitted by the head of the respective department.

Semester End Examination - UG				
Part	Type of Questions	No. of Questions	Marks per Question	Total
Part-A	Compulsory question which consists of ten sub-questions from all modules	10	1	10
Part-B	Internal choice questions (Module-wise)	5	10	50
Total				**60**

8.3 Practical Courses:

8.3.1 Continuous Internal Evaluation (CIE):

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

8.3.3 Semester End Examination (SEE):

The Semester End Examination shall be conducted with an external examiner and the Internal Examiner. External examiner will be appointed by the Chief Controller of Examinations/Principal of the college. The external examiner should be selected from the outside college among the autonomous/reputed institutions from a panel of three examiners submitted by the concerned Head of the Department.

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 Over all 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

8.4 Engineering Drawing :

For Drawing subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination.

The distribution of marks for CIE is given below

CIE for Engineering Drawing/ Engineering Graphics				
Part	Type of Questions	No. of Questions	Marks per Question	Total
Part - A	Day – to – Day Work			10
Mid – Term Examination				
Part - B	Internal choice questions (Module-wise)	5	6	30
Total				40

The average of the two Mid Term Examinations shall be taken as the final marks for Mid Term Examination (for 40 marks).

The distribution of marks for SEE is given below

Semester End Examination - Engineering Drawing/ Engineering Graphics				
Part	Type of Questions	No. of Questions	Marks per Question	Total
Part-A	compulsory question which consists of ten sub-questions from all modules	10	1	10
Part-B	Internal choice questions (Module-wise)	5	10	50
Total				60

Machine Drawing:

For Drawing subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination.

The distribution of marks for **CIE** is given below

Type of Questions	No. of Questions	Marks per Question	Total
CIE for Machine Drawing			
Day to Day Work			10
I Mid Term Examination			
Part Drawing (4 out of 6)	4	7.5	30
Total			40

Type of Questions	No. of Questions	Marks per Question	Total
CIE for Machine Drawing			
Day to Day Work			10
II Mid Term Examination			
Assembly Drawing (1 out of 2)	1	30	30
Total			40

The average of the two Mid Term Examinations shall be taken as the final marks for Mid Term Examination (for 40 marks).

The distribution of marks for **SEE** is given below

Type of Questions	No. of Questions	Marks per Question	Total
SEE for Machine Drawing			
Part A (2 out of 4)	Part Drawing	10	20
Part B - (Compulsory Question)	Assembly Drawing	40	40
Total			60

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

II Year II Semester Real-Time (or) Field-based Research Project course: The internal evaluation is for 100 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The total marks of two Mid-Term examinations is the final for 100 marks. Student shall have to earn 40%, i.e 40 marks out of 100 marks from 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 Projects:
8.5.1 Internship/Mini Project:

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 I-Year II Semester, 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.

Project:
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.

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 report on 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.

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 from the 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 total of the CIE and SEE taken together.

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

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.

8.6.3 Seminar:
For Seminar presentation, the student shall collect the information on a specialized topic, prepare a report and submit to the department at the time of seminar presentation. The seminar presentation (along with the report) shall be evaluated by a committee consisting of Seminar coordinator and two senior faculty members with appropriate grade. The

seminar report shall be evaluated internally for 100 marks. There shall be no semester end examination for the seminar.

8.6 Non-Credit Courses:

8.7.1 Mandatory Courses:

For mandatory courses of Environmental Science, Constitution of India, Intellectual Property Rights, and Gender Sensitization lab, a student has to secure 40 marks out of 100 marks (i.e. 40% of the 100 marks allotted) in the Continuous Internal Evaluation for passing the subject/course. Two internal exams shall be conducted and evaluated for 50 marks. The student has to secure minimum 40% of the marks in each internal exam as per 8.3.2. These marks should also be uploaded along with the internal marks of other subjects.

No marks or letter grades shall be allotted for mandatory/non-credit courses. Only Pass/Fail shall be indicated in Grade Card.

8.7.2 Audit Courses:

For Audit Courses offered in any Semester, the student must submit a '**Participation Certificate**' from the concerned authorities. Internship program is also conducted under the category of Audit Courses. The student needs to submit a detailed report to the department after internship program. No marks or Letter Grade shall be allotted for these activities.

8.7.3 Acceleration of course work of final semester

In order to allow the bright and motivated students, a provision is made to complete the final semester three open elective subjects (I, II and III) in advance. These subjects are offered through during III-Year II Semester (OE-I), IV-Year I Semester (OE-II) and IV year II Semester (OE-III) and credit transfer is permitted. These credits are shown in the Final Semester Grade card in order to calculate SGPA and CGPA.

This provision is made to allow the students for industry internship or to undertake projects in industry in the final semester. A student at the end of the II-Year II Semester having a CGPA of ≥ 7.0 without any backlogs is eligible to register for OE-I in Third Year Second semester. In the same way to register for OE-II and OE-III the student has to secure a CGPA of ≥ 7.0 at the end of the III- Year I Semester and III-Year II Semester respectively.

Departments will notify at the time of registration about the minimum and the maximum number of students to be enrolled for a particular open elective to be offered.

The list of open electives offered during that semester will be notified by the departments at the time of course work registration.

8.7.4 Massive Open Online Courses

8.7.4.1 To meet the global requirements by providing greater flexibility to choose a variety of courses to inculcate the habit of self-learning, in compliance with the UGC guidelines, Massive Open Online Courses (MOOCs) shall be provided during the period of study.

8.7.4.2 The students are allowed to register MOOCs courses up to a maximum of 15% of total credits under professional electives courses, subjected to the approval by the concerned Head of the Department. The proposed MOOCs would be additional choices in the program elective/open elective group of courses subject to their offering by the department as well as their availability in MOOCs platform during the respective semester. However, the Board of studies of the respective department shall approve contemporary courses from time to time under MOOCs.

8.7.4.3 Concerned departments shall declare the list of the courses that a student can pursue at the beginning of the semester. Students interested in pursuing MOOCs shall register the course at their department at the beginning of the semester against the courses that are announced by the department. Course progress shall be monitored by the course coordinator of the department. Each of the course shell be of minimum 12 weeks in duration.

8.7.4.4 The Students registered for MOOC Courses shall be Evaluated for CIE as per 8.2.1. The SEE evaluation will be considered as per 8.2.2. If the students fails to clear the subject, he/she has to re- register for the course.

8.7.4.5 The grade equivalency for MOOCs courses shall be recommended by the respective BOS chairperson and is to be approved by the Chairman, academic council.

9.0 Grading Procedure

9.1 Grades will be awarded to indicate the performance of each student in each Theory Subject, Laboratory/Practicals/ Industry-Oriented Mini Project/Internship/SDC (Skill Development Center) and Project Stage, based on the % of marks obtained in CIE + SEE both taken together as specified in Item No. 8 and a corresponding Letter Grade shall be given.

9.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed.

% of Marks	Grade Points	Letter Grade
≥90	10	(Out Standing)
≥80 to < 90	9	A$^+$ (Excellent)
≥70 to < 80	8	A (Very Good)
≥60 to < 70	7	B$^+$ (Good)
≥50 to <60	6	B (Average)
≥40 to < 50	5	C (Pass)
< 40	0	F (Fail)
Absent	0	Ab

9.3 A student obtaining **'F'** Grade in any subject shall be considered '**Failed'** and will be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE) as and when conducted. In such cases, his / her Internal Marks (CIE Marks) in those subject(s) will remain same as those he / she obtained earlier.

9.4 A Letter Grade does not imply any specific % of marks.

9.5 In general, a student shall not be permitted to repeat any Subject/ Course (s) only for the sake of 'Grade Improvement' or 'SGPA / CGPA Improvement'. However, he /

she has to repeat all the Subjects/ Courses pertaining to that semester, when he / she is detained (as listed in Items Nos.7.7 &7.8).

9.6 A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course (excluding Mandatory non-credit Courses).Then 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 The Student passes the Subject/ Course only when he / she gets GP $\geq$ 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

$$SGPA = \left\{ \sum_{i=1}^{N} C_i G_i \right\} / \left\{ \sum_{i=1}^{N} C_i \right\} \text{ … for each semester}$$

where 'i' is the subject indicator index (takes into account all subjects in a semester), 'N' is the number of subjects registered for the semester (as specifically required and listed under the Course Structure of the parent department) is the number of credits allotted to the i^{th}subject and represents the Grade Points (GP)corresponding to the Letter Grade awarded for that i^{th}subject.

9.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in all registered courses in ALL semesters and the total number of credits registered in all the semesters. CGPA is rounded off to two decimal places. CGPA is thus computed from the II semester onwards, at the end of each semester, as per the formula.

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

(i.e., up to and inclusive of 'S' semesters, S $\geq$ 2)

where 'M' is the total number of subjects (as specifically required and listed under the course structure of the parent department) the student has registered from the 1^{st}semester onwards up to and inclusive of the semester 'S' (obviously M > N), 'j' is the subject indicator index (takes in to account all subjects from '1' to 'S' semesters) is the number of credits allotted to the j^{th}subject, and 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 however, 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	3	A	8	3 x 8 = 24
Course 2	3	O	10	3 x 10 = 30
Course 3	3	C	5	3 x 5 = 15
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	1.5	B	6	1.5 x 6 = 09
Course 7	1.5	A	8	1.5 x 8 = 12
Course 8	2	A	8	2 x 8 = 16
	Total = 20			Total Credit Points = 151

$$SGPA = 151/20 = 7.55$$

ILLUSTRATION OF CALCULATION OF CGPA:

Semester	Credits	SGPA	Credits X SGPA
Semester I	21	7	21 X 7 = 147
Semester II	19	6	19 X 6 = 114
Semester III	22	6.5	22 X 6.5 = 143
Semester IV	20	6	20 X6 = 120
Semester V	22	5.75	22 X 5.75 = 126.5
Semester VI	18	7.25	18 X 7.25 = 130.5
Semester VII	18	8	18 X 8 = 144
Semester VIII	20	8.5	20 X 8.5 = 170
	160		1095

CGPA = 1095/160 = 6.84

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 For calculations listed in Item Nos.9.6 to 9.10, performance in failed Subjects/ Courses (securing 'F' Grade) will also be taken into account and the credits of such Subjects/Courses will also be included in the multiplications and summations. However, Mandatory Courses will not be taken into consideration.

9.12 Passing Standards:

9.12.2 A student shall be declared successful or 'passed' in a semester, only when he / she gets a SGPA $\geq$ 5.00 (at the end of that particular semester); and a student shall be declared successful or 'passed' in the entire B.Tech Programme, only when he / she gets a CGPA $\geq$ 5.00; subject to the condition that he / she secures a GP $\geq$ 5 ('C' Grade or above) in every registered Subject/ Course in each semester (during the entire B.Tech Programme) for the award of degree, as required.

9.12.3 After the completion of each semester, a grade card or grade sheet shall be issued to all the 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.**

9.12.4 In spite of securing 'P' Grade or above in some (or all)Subjects/ Courses in any semester, if a student receives a SGPA < 5.00 and/ or CGPA < 5.00 at the end of such a semester, then he / she 'may be allowed' (on the 'specific recommendations' of the Head of the Department and subsequent approval from the Principal) (i) to go into the next subsequent semester (subject to fulfilling all other attendance and academic requirements as listed under Item Nos. 7&8);(ii) to 'improve his / her SGPA of such a semester (and hence CGPA) to 5.00 or above', by reappearing for one or more (as per student's choice) of the same course(s) in

which he / she has secured 'P' Grade(s) in that semester, at the Supplementary Examinations to be held in the next subsequent semester(s). In such cases, his / her Internal Marks (CIE Marks) in those subject(s) will remain same as those he / she obtained earlier. In these considerations, the newly secured Letter Grades will be recorded and taken into account for calculation of SGPA and CGPA, only if there is an improvement.

9.12.5 After the completion of each semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the 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 and Grade Earned etc.), Credits earned, SGPA and CGPA.

10   Declaration of Results
10.1 Computation of SGPA and CGPA are done using the procedure listed in items 9.6 to 9.12.
10.2 For final % of marks equivalent to the computed final CGPA, the following formula may be used …

$$\textbf{\% of Marks = (final CGPA – 0.5) x 10}$$

11   Award of Degree
11.1 A student who register for all the specified courses as listed in the Course Structure, satisfies all the course requirements, passes all the examinations prescribed in the entire B.Tech Programme within the specified period (refer 4.1) and secures the required 160 Credits (with CGPA $\geq$ 5.0) shall be declared to have '**Qualified'** for the award of the B.Tech. Degree in the chosen branch of engineering as selected at the time of admission.

11.2 A student who qualifies for the award of the degree as listed in Item 11.1, shall be placed in one of the following classes:

Class Awarded	CGPA
First Class with Distinction	≥ 8.00
First Class	≥ 7.0 and < 8.00
Second Class	≥ 6.0 and < 7.0
Pass Class	≥ 5.00 and < 6.0

11.3 A student with final CGPA (at the end of the B.Tech Programme) <5.00 will not be eligible for the award of the degree.
11.4 Students will be eligible for the award of '**Gold Medal'**, if he/she should have passed all the subjects/courses in first appearance within the first academic years (or eight sequential semesters) from the date of commencement of first year first semester and should have secure CGPA $\geq$ 8.00 at the end of eight sequential semesters.
11.5 A student will be eligible to get under graduate with honours or additional minor engineering if he/she completes an additional 20 credits through MOOCs.

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 classwork for that semester.*

3. *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.*

4. 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).

12 Withholding of Results

If the student has not paid fees to college at any stage or has pending dues against his / her name due to any reason whatsoever or if any case of indiscipline is pending against him, the result of the student may be with-held and he / she will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

13 Transitory Regulations

A. **For students detained due to shortage of attendance**:

1. A student who has been detained in I year of MR18/MR20/MR21 regulations due to lack of attendance, shall be permitted to join I year I Semester of MR22 regulations and he / she is required to complete the study of B.Tech 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 MR18 /MR20 /MR21 regulations for want of attendance, shall be permitted to join the corresponding semester of MR22 regulations and is required to complete the study of B.Tech., within the stipulated period of eight academic years from the date of first admission in I Year. The MR22 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 MR18/MR 20/MR21 regulations, who has been detained due to lack of credits, shall be promoted to the next semester of MR22 regulations only after acquiring the required credits as per the corresponding regulations of his/her first admission. The student is required to complete the B.Tech Programme within the stipulated period of eight academic years from the year of first admission. The MR22 academic regulations are applicable to a student from the year of readmission onwards. See rule (C) for further Transitory Regulations.

C. **For readmitted students in MR22 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 MR22 regulations. **There is NO exemption of credits in any case**. The performance evaluation of the student will be done after the exemption of two subjects if total credits acquired are ≤ 160, (see item 7.5).
3   If a student readmitted to MR22 regulations, has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in MR22 regulations will be substituted by another subject to be suggested by the College Academic Committee (CAC).

Note: If a student readmitted to MR22 regulations, has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in MR22 regulations, the departments concerned shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

14   Student Transfers

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

14.2 The students seeking transfer to MALLA REDDY ENGINEERING COLLEGE (Autonomous)-MREC(A) from various other Universities/ Institutions have to pass the failed subjects which are equivalent to the subjects of MREC(A) and also pass the subjects of MREC(A) 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 MREC(A), the students have to study those subjects in MREC(A) inspite of the fact that those subjects are repeated.

14.3 The transfer students from other Universities / Institutions to MREC(A) who are on rolls will be provided one chance to write internal examinations in the failed subjects and/or subjects not studied as per the clearance letter issued by the JNTUH.

14.4 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, as per the clearance (equivalence) letter issued by the University.

15. Transitory Regulations

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of MR20 Regulations due to lack of attendance, shall be permitted to join I year I Semester of MR22 Regulations and he is required to complete the study of B.Tech. 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 MR20 regulations for want of attendance, shall be permitted to join the corresponding semester of MR22 Regulations and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year. The MR22 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:

3. A student of MR20 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of MR22 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 MR20 & MR22 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 MR22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.

C. For readmitted students in MR22 Regulations:

4. A student who has failed in any subject under any regulation has to pass those subjects in the same regulations.
5. 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 MR22 Regulations. **There is NO exemption of credits in any case**.
6. If a student is readmitted to MR22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in MR22 Regulations will be substituted by another subject to be suggested by the college academic administration.

Note:
If a student readmitted to MR22 Regulations and has not studied any courses/topics in his/her earlier regulations of study which is prerequisite for further subjects in MR22 Regulations, then the college shall conduct remedial classes to cover those courses/topics for the benefit of the students.

16. Transfer of students from the Constituent Colleges of JNTUH or from other Colleges / Universities:

a) Transfer of students from the Constituent Colleges of JNTUH or from other Colleges/ Universities shall be considered only on case-to-case basis.

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

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

d) The transferred students from other Universities/institutions to MREC who are on rolls are to be provided one chance to write the CBT (internal marks) in the **equivalent course(s)** as per the clearance (equivalence) letter issued by the University.

17. General Rules
a) The academic regulations should be read as a whole for the purpose of any interpretation.
b) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.
c) In case of any error in the above rules and regulations, the decision of the Academic Council is final.
d) The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

18. Scope
(i) Where the words "he", "him", "his", occur in the write – up of regulations, they include "she", "her", "hers".
(ii) Where the words "Subject" or "Subjects", occur in these regulations, they also imply "Course" or "Courses".
(iii) The academic regulations should be read as a whole, for the purpose of any interpretation.
(iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the College Academic Committee headed by the Principalwill be considered as final.

Academic Regulations for B.Tech.(Lateral Entry Scheme)
w.e.f the A Y 2023-24

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

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

2. The student shall register for 120 credits and secure 120 credits with CGPA $\geq$ 5 from II year to IVyear B.Tech. Programme (LES) for the award of B.Tech. degree.

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

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

5. **Promotion Rule:**

Sl.No.	Promotion	Conditions to be fulfilled
1	Second year first semester (III Semester) to second year second semester (IV Semester)	Regular course of study of second year first semester (III Semester).
2	Second year second semester (IV Semester) to third year first semester (V Semester).	**(i)** Regular course of study of second year second semester (IV Semester) **(ii)** Must have secured at least 60% credits up to second year second semester (IV Semester) from all the relevant regular and supplementary examinations, whether the
3	Third year first semester (V Semester) to third year second semester (VI Semester)	Regular course of study of third year first semester (V Semester).
4	Third year second semester (VI Semester) to fourth year first semester (VII Semester)	**(i)** Regular course of study of third year second semester (VI Semester) **(ii)** Must have secured at least 60% credits up to third year second semester (VI Semester) from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester (VII Semester) to fourth year second semester (VIII Semester)	Regular course of study of fourth year first semester (VII 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.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

Sl.No.	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course 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 candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course 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 that course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that semester. The hall ticket of the candidate shall be cancelled.
3	Impersonates any other candidate in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original student who has been impersonated, shall be cancelled in all

		the courses of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The student is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
6	Refuses to obey the orders of the Chief Controller of Examinations (CCE) / Controller of Examinations (CE) / Assistant Controller of Examinations (ACE) / 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	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over

	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-incharge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination	to the police and a police cases registered against them.
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme by the student is subject to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also

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

Note: *The student(s) found indulging in malpractices during the CIE also will be punished based on the recommendations of the College Academic Committee.*

Malpractices identified by squad or special invigilators
1. Punishments to the students as per the above guidelines.

Academic Regulations for B.Tech. with Minors Programme under MR22
(Applicable for Batches Admitted from 2022-23)

1. Objectives

The key objectives of offering B. Tech. with Minor program are:
- To expand the domain knowledge of the students in one of the other programmes of engineering.
- To increase the employability of undergraduate students keeping in view of better opportunity in interdisciplinary areas of engineering & technology.
- To provide an opportunity to students to pursue their higher studies in the inter-disciplinary areas in addition to their own programme of study.
- To offer the knowledge in the areas which are identified as emerging technologies/thrust areas of Engineering.

2. Academic Regulations for B.Tech. Degree with Minor programmes
- A student shall be awarded B.Tech with Minor, if he/she earns a minimum of 18 credits in the respective minor program in addition to the 160 credits of 4 year B.Tech program. These credits shall be acquired by either registering courses in the respective minor program offered by the college or through MOOCs equivalent to the courses offered by the university.
- A student enrolled in a B.Tech program may do a Minor in another area (ex., B.Tech. in Mechanical Engineering with Minor in AI&ML).
- The additional 18 credits for B.Tech with Minor program may be obtained between the 5 thand 8 th semester within the 4-year B. Tech program

a) The duration of the course and all the academic regulations are on par with regular 4-years B. Tech. program.

b) The weekly instruction hours, internal and external evaluation, and award of grades for courses registered in minor program are on par with courses of 4-year B.Tech. program.

c) After registering for the Minor program, if a student is unable to earn the required 18 credits in a specified duration (twice the duration of the course i.e. 8 years), he/she shall not be awarded Minor degree. However, if the student earns the required 160 credits of B.Tech., he/she will be awarded only B. Tech degree in the concerned branch.

d) There is no transfer of credits from Minor program to regular B.Tech program and vice-versa.

e) The additional 18 credits shall be earned by either registering courses in the respective minor program offered by the host department in the college or do a course in MOOCs platform.

f) For the course selected under MOOCS platform following guidelines may be followed:
i. Prior to registration of MOOCS courses, formal approval of the courses by the University/College is essential. The approval is based on the parameters like the institute / agency offering the course, syllabus, credits, duration of the programme and mode of evaluation etc.

ii. Minimum credits for MOOCs course must be equal to or more than the credits specified in the Minor course structure provided by the University/College.

iii. Only grades/marks above pass-grade/pass-marks shall be considered for inclusion of grades in minor grade memo.

iv. Any expenses incurred for the MOOCS courses are to be met by the students only.

g) A student after registering for a minor program can withdraw at any time. On withdrawal, a student will be awarded only B.Tech in the concerned branch if he fulfils all academic requirements and earns 160 credits.

i) A student can choose only one minor program along with his/her basic engineering degree. A student who chooses an honours program is not eligible to choose a minor program and vice-versa.

j) A student can graduate with a minor if he/she fulfils the requirements of regular B.Tech. program and the requirements of minor program

k) The institute shall maintain a record of students registered and pursuing their Minor programmes, minor programme-wise and parent programme -wise. The same report needs to be sent to the University once the enrolment process is complete.

l) The institute / department shall prepare the time-tables for each Minor course offered at their respective institutes without any overlap/clash with other courses of study in the respective semesters.

3. Eligibility conditions for the student to register for Minor programme

i) Students who have earned all the credits (no active backlogs) till II year I semester at the time of entering III year I semester are eligible to register for minor program.

ii) A prior approval of mentor and Head of the Department for enrolment into minor program is mandatory before the commencement of III year I semester.

iii) Registration to a minor program is purely the choice of the students. Only top 50% of the total class in each specialization are eligible to register for minor programs. The merit is based on the overall percentage of marks without active backlogs up to 3rdsemester (II-year I semester).

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4. Registration for the courses in Minor Programme

a) At the beginning of each semester, just before the commencement of classes, students shall register for the courses which they wish to take in that semester.

b) The students should choose a course from the list against each semester (from Minors course structure) other than the courses they have studied/registered for regular B.Tech. programme. No course should be identical to that of the regular B.Tech. course. The students should take the advice of faculty mentors while registering for a course at the beginning of semester.

c) The maximum No. of courses for the Minor is limited to two (three in case of inclusion of lab) in a semester along with regular semester courses.

d) The registration fee to be collected from the students by the College is **Rs. 1000/-** per one credit.

e) A fee for late registration may be imposed as per the norms.

5. Minor courses and the offering departments

S. No.	Minor Programme	Eligible programme of students	@Offering Department	Award of Degree
1	CSE	CE, EEE, ME, ECE, Mi.E	CSE / CSE (AI&ML) /B.Tech. (AI&ML)/ B.Tech. (AI)/ B.Tech. CSE(AI)	"B.Tech. in programme name with Minor in CSE"
2	Electric Vehicles	All branches	EEE	"B.Tech. in programme name with Minor in EEE"
3	Construction Technology	All branches	CE	"B.Tech. in programme name with Minor in CE"
4	Robotics	All branches	ME	"B.Tech. in programme name with Minor in ME"
5	AIML	All branches, except CSE-AIML	CSE - AIML	"B.Tech. in programme name with Minor in CSE-AIML"

Category	Course Code	Subject	L	T	P	Credits	CIE	SEE	TOT
colspan="3"	**I B.Tech I Semester**			**Hours**		**Credits**		**Marks**
Category	**Course Code**	**Subject**	**L**	**T**	**P**		**CIE**	**SEE**	**TOT**
BSC	D0B01	Matrices and Calculus	3	1	-	4	40	60	100
BSC	D0B08	Applied Physics	3	1	-	4	40	60	100
BSC	D0B10	Engineering Chemistry	3	1	-	4	40	60	100
ESC	D0501	Programming for Problem Solving	3	-	-	3	40	60	100
BSC	D0B09	Applied Physics Lab	-	-	2	1	40	60	100
BSC	D0B11	Engineering Chemistry Lab	-	-	2	1	40	60	100
ESC	D0502	Programming for Problem Solving Lab	-	-	2	1	40	60	100
ESC	D0302	Engineering Workshop Lab	-	-	2	1	40	60	100
		Total	12	3	8	19			**800**

Category	Course Code	Subject	L	T	P	Credits	CIE	SEE	TOT
	**I B.Tech II Semester**			**Hours**		**Credits**		**Marks**
Category	**Course Code**	**Subject**	**L**	**T**	**P**		**CIE**	**SEE**	**TOT**
BSC	D0B02	Ordinary Differential Equations and Vector Calculus	3	1	-	4	40	60	100
PCC	D0303	Engineering Mechanics	3	-	-	3	40	60	100
PCC	D0203	Basic Electrical and Electronics Engineering	3	-	-	3	40	60	100
ESC	D0301	Engineering Graphics	3	-	-	3	40	60	100
HSMC	D0H01	English for Skill enhancement	3	1	-	4	40	60	100
PCC	D0304	Engineering Mechanics Lab	-	-	2	1	40	60	100
PCC	D0204	Basic Electrical and Electronics Engineering Lab	-	-	2	1	40	60	100
PCC	D0505	Basic Python Programming Lab	-	-	2	1	40	60	100
HSMC	D0H02	English Language and Communication Skills Lab	-	-	2	1	40	60	100
		Total	15	2	8	21			**900**

		II B.Tech I Semester	Hours			Credits	Marks		
Category	Course Code	Subject	L	T	P		CIE	SEE	TOT
BSC	D0B06	Probability and Statistics	3	1	0	3	40	60	100
PCC	D0101	Building Materials, Construction and Planning	3	0	0	3	40	60	100
PCC	D0102	Surveying	3	0	0	3	40	60	100
PCC	D0103	Strength of Materials – I	3	0	0	3	40	60	100
PCC	D0104	Fluid Mechanics	3	0	0	3	40	60	100
PCC	D0105	Surveying Laboratory - I	0	1	2	1	40	60	100
PCC	D0106	Strength of Materials Laboratory	0	0	2	1	40	60	100
PCC	D0107	Computer Aided Drafting Laboratory	0	0	2	1	40	60	100
ESC	D0554	Fundamentals of Data Structures lab	0	1	2	2	40	60	100
MC	D00M2	Environmental Science	3	0	0	0	100	-	
		Total	**18**	**3**	**8**	**20**			**900**

		II B.Tech II Semester	Hours			Credits	Marks		
Category	Course Code	Subject	L	T	P		CIE	SEE	TOT
PCC	D0108	Engineering Geology	3	0	0	3	40	60	100
PCC	D0109	Concrete Technology	3	0	0	3	40	60	100
PCC	D0110	Strength of Materials – II	3	0	0	3	40	60	100
PCC	D0111	Hydraulics and Hydraulics Machinery	3	0	0	3	40	60	100
PCC	D0112	Structural Analysis - I	3	0	0	3	40	60	100
PCC	D0113	Fluid Mechanics and Hydraulics Machinery Laboratory	0	0	2	1	40	60	100 / 100
PCC	D0114	Advanced Surveying Laboratory	0	1	2	1	40	60	100
PCC	D0115	Concrete Technology Laboratory	0	0	2	1	40	60	
PCC	D00P1	Real-time Research Project/ Field-Based Project	0	0	4	2	40	60	100
MC	D00M1	Gender Sensitization Laboratory	0	0	2	0	100	-	
		Total	**15**	**1**	**12**	**20**			**900**

Category	Course Code	III B.Tech I Semester Subject	Hours			Credits	Marks		
			L	T	P		CIE	SEE	TOT
PCC	D0116	Repair & Rehabilitation of Structures	3	0	0	3	40	60	100
PCC	D0117	Geotechnical Engineering	3	0	0	3	40	60	100
PCC	D0118	Structural Engineering -I (RCC)	3	0	0	3	40	60	100
HSMC	D0H08	Business Economics & Financial Analysis	3	0	0	3	40	60	100
PCC	D0119	Transportation Engineering	3	0	0	3	40	60	100
PCC	D0120	Hydrology and Water Resources Engineering	3	0	0	3	40	60	100
PCC	D0121	Transportation Engineering Laboratory	0	0	2	1	40	60	100
PCC	D0122	Geotechnical Engineering Laboratory	0	0	2	1	40	60	100
MC	D00M6	Intellectual Property Rights	3	0	0	0	100	-	
MC	D00M3	Quantitative Aptitude & Verbal Reasoning-I	0	0	2	0	100	-	
		Total	**21**	**0**	**6**	**20**			**800**

Category	Course Code	III B.Tech II Semester Subject	Hours			Credits	Marks		
			L	T	P		CIE	SEE	TOT
PCC	D0124	Environmental Engineering	3	0	0	3	40	60	100
PCC	D0125	Foundation Engineering	3	0	0	3	40	60	100
PCC	D0126	Structural Engineering -II (Steel Structures)	3	0	0	3	40	60	100
PEC-I	D0127	Green Building Technologies	3	0	0	3	40	60	100
	D0128	Geomatic Applications in Civil Engineering							
	D0129	Smart Cities Planning and Management							
	D0130	Road Safety System							
	D0131	Disaster Management and Mitigation							
OEC-I		OPEN ELECTIVE -I	3	0	0	3	40	60	100
PCC	D0132	Environmental Engineering Laboratory	0	0	2	1	40	60	100
PCC	D0133	Computer Aided Design Laboratory	0	0	2	1	40	60	100
HSMC	D0H03	Advanced English Communication Skills Laboratory	0	0	2	1	40	60	100
PROJ	D00P2	Industry Oriented Mini Project/ Internship	0	0	4	2	40	60	100
MC	D00M4	Quantitative Aptitude& Verbal Reasoning-II	2	0	0	-	100	-	
MC	D00M5	Constitution of India	2	0	0	-	100	-	
		Total	**19**	**0**	**10**	**20**			**900**

IV B.Tech I Semester			Hours			Credits	Marks		
Category	Course Code	Subject	L	T	P		CIE	SEE	TOT
PCC	D0134	Estimation, Costing & Valuation	2	0	0	2	40	60	100
PCC	D0135	Construction Technology & Project Management	2	0	0	2	40	60	100
PEC-II	D0136	Prestressed Concrete	3	0	0	3	40	60	100
	D0137	Elements of Earthquake Engineering							
	D0138	Advanced Structural Analysis							
	D0139	Advanced Concrete Technology							
	D0140	Structural Dynamics							
PEC-III	D0141	Earth Retaining Structures	3	0	0	3	40	60	100
	D0142	Ground Improvement Techniques							
	D0143	Stability Analysis of Slopes							
	D0144	Soil Structure Interaction							
	D0145	Dynamics of Soils and Foundation							
PEC-IV	D0146	Design of Hydraulic Structures	3	0	0	3	40	60	100
	D0147	Advanced Water Resources Engineering							
	D0148	Ground Water Hydrology							
	D0149	Watershed Management							
	D0150	Remote Sensing and GIS							
OEC-II		OPEN ELECTIVE -II	3	0	0	3	40	60	100
PCC	D0151	Civil Engineering Software Laboratory	0	0	2	1	40	60	100
PROJ	D00P3	Project Stage - I	0	0	6	3	40	60	100
		Total	**16**	**0**	**8**	**20**			**800**

IV B.Tech II Semester			Hours			Credits	Marks		
Category	Course Code	Subject	L	T	P		CIE	SEE	TOT
PEC-V	D0152	Soild Waste Management	3	0	0	3	40	60	100
	D0153	Environmental Impact Assessment							
	D0154	Air Pollution							
	D0155	Industrial Waste Water Treatment							
	D0156	Geo Environmental Engineering							
PEC-VI	D0157	Railways, Airport & Harbour Engineering	3	0	0	3	40	60	100
	D0158	Pavement Asset Management							
	D0159	Pavement Analysis & Design							
	D0160	Traffic Engineering and Management							
	D0161	Public Transportation							
OEC-III		OPEN ELECTIVE -III	3	0	0	3	40	60	100
PROJ	D00P4	Project Stage -II including Seminar	0	0	22	11	80	120	100
		Total	**9**	**0**	**22**	**20**			**400**

Prerequisites: Mathematics Knowledge at pre-university level

Course Objectives: To learn

1) The types of matrices, finding the inverse of a matrix, rank of a matrix, and applying the concept of rank to know the consistency of linear equations and to find all possible solutions, if any exist.
2) Eigen values and Eigen vectors of a matrix, Diagonalization of a matrix, the Cayley Hamilton theorem, and reducing a quadratic form into a canonical form through an orthogonal transformation.
3) Concept of mean value theorems and their applications to the mathematical problems and Evaluation of improper integrals using beta and gamma functions.
4) Partial differentiation, Jacobian, maxima and minima, and Taylor series expansion of functions of two variables.
5) Evaluation of multiple integrals and their applications in the allied fields.

MODULE I: Matrices   [8 Periods]
Matrices: Types of Matrices, Symmetric, Skew-symmetric,Hermitian,Skew-Hermitian, orthogonal and Unitary matrices; Rank of a matrix by Echelon form and Normal form; Inverse of Non-singular matrices by Gauss-Jordan method; Solving system of homogeneous and non-homogeneous linear equations, Linearly independent and dependent set of vectors, LU – Decomposition Method.

MODULE II: Eigen Values and Eigen Vectors   [8 Periods]
Linear Transformation, Orthogonal Transformation: Eigen values, Eigen vectors,and their properties; Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); Finding the inverse and power of a matrix by Cayley-Hamilton Theorem.
Quadratic Forms: Nature, rank, index and signature of the Quadratic form, Reduction of Quadratic form to Canonical forms by Orthogonal Transformation method.

MODULE III: Calculus   [10 Periods]
(A) Mean value theorems: Rolle's Theorem and Lagrange's Mean value theorem with their Geometrical Interpretation and its applications, Cauchy's mean value theorem. Taylor's Series.(All theorems without proof)
(B) Beta and Gamma Functions
Introduction to Improper Integrals, Definition of Beta and Gamma Functions, Properties and Other Forms. Relation between beta and gamma functions. Evaluation of improper integrals using beta and gamma functions.

MODULE –IV: **Multivariable Calculus**   [10 Periods]
Definitions of Limit and Continuity. Partial Differentiation: Euler's Theorem, Total Derivative, Jacobian, Functional dependence and independence. Taylor's Series for functions of two variables, Applications: Maxima and Minima of function two variables and three variables using Method of Lagrange Multipliers.

MODULE - V: Multiple Integrals   **[12 Periods]**

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 (Cartesian to spherical and cylindrical polar coordinates) for triple integrals. Finding areas using double integrals and volumes using double and triple integrals.

TEXT BOOKS:
1) B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2) D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
3) Richard Bellman, Introduction to matrix Analysis, Siam, second Edition.
4) R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition 2016.

REFERENCES:
1) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
3) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,
Reprint, 2008.
4) V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, AffiliatedEast–West press, Reprint 2005.
5) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint,2010.

Course Outcomes: After completion of the course, the student should be able to
1) Find the Rank of a matrix, inverse of a matrix and analyse the solution of system of linear equations.
2) Find the Eigen values and Eigen vectors of a matrix, Diagonalization of a matrix, verification of Cayley Hamilton theorem and Reduce the quadratic form to canonical form.
3) Verify mean value theorems; expand the given function using Taylor's series and Evaluate Improper Integrals using Beta and Gamma Functions.
4) Find the Jacobian, maxima and minima, Taylor series expansion of functions of two variables and partial derivatives.
5) Evaluate multiple integrals and its applications in areas and volumes.

CO- PO Mapping												
(3/2/1indicates strength of correlation) 3-Strong,2-Medium,1-Weak												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	2	3	3							2
CO2	3	2	2								2	
CO3	3			3	2						3	2
CO4		2	2	2	3						2	2
CO5	2	2	2	3	3							2

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. I Semester		
Code: D0B08	**Applied Physics** Common to: CE, ME, IT, CSM, CSD	L	T	P
Credits: 4		3	1	0

Pre-requisites: 10 + 2 Physics

Course Objectives:
The objectives of this course for the student are to:
1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
3. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
4. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibres.

Course Outcomes:
At the end of the course the student will be able to:
1. 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.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
4. Appreciate the features and applications of Nanomaterials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

MODULE - I: QUANTUM PHYSICS AND SOLIDS

Quantum Mechanics: Introduction to quantum physics, blackbody radiation — Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect - Davisson and Germer experiment —Heisenberg uncertainty principle - Born interpretation of the wave function — time independent Schrodinger wave equation - particle in one dimensional potential box.
Solids: Symmetry in solids, free electron theory (Drude & Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model — E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

MODULE - 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.

MODULE - III: DIELECTRIC, MAGNETIC AND ENERGY MATERIALS

Dielectric Materials: Basic definitions- types of polarizations (qualitative) - ferroelectric, piezoelectric, and pyroelectric materials —applications — liquid crystal displays (LCD) and crystal oscillators.

Magnetic Materials: Hysteresis - soft and hard magnetic materials - magnetostriction, magnetoresistance - applications - bubble memory devices, magnetic field sensors and multiferroics. Energy Materials: Conductivity of liquid and solid electrolytes-superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

MODULE - IV: NANOTECHNOLOGY
Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods — top-down fabrication: ball milling - physical vapor deposition (PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nanomaterials.

MODULE - V: LASER AND FIBER OPTICS
Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations- lasing action - pumping methods- ruby laser, He-Ne laser , CO_2 laser, Argon ion Laser, Nd:YAG laser- semiconductor laser-applications of laser.

Fiber Optics: Introduction to optical fiber- advantages of optical Fibers - total internal reflection- construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers- losses in optical fiber - optical fiber for communication system - applications.

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.
6. P K Palanisamy, "Engineering Physics", SciTech Publication, 6th Edition, 2018.

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 1st Edition, 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, 1°* Edition, 2022.

e-RESOURCES
1. https://www.researchgate.net/publication/259574083_Lecture_Notes_on_Engineering_Physics
2. https://www.livescience.com/33816-quantum-mechanics-explanation.html
3. https://nptel.ac.in/courses/115/102/115102025/

Journals :
1. http://www.springer.com/physics/theoretical%2C+mathematical+%26+computational+physics/journal/40094
2. http://www.springer.com/physics/journal/340

NPTEL VIDEOS:
1. http://nptel.ac.in/courses/113104012/
2. https://www.youtube.com/watch?v=9seDKvbaoHU&list=PLzJaFd3A7DZse2tQ2qUFChSiCj7jBidO0&index=29
3. https://nptel.ac.in/courses/108/108/108108122/
4. https://nptel.ac.in/courses/115/101/115101005/

COS	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak											
	Programme Outcomes(POs)											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3		2								
CO2	3	3		2								
CO3	3	2		1			1					
CO4	3	2		1	2	2	2					
CO5	3	2				2	1					

2024-25 Onwards (MR-24)	**MALLA REDDY ENGINEERING COLLEGE** (Autonomous)		**B. Tech. I Semester**	
Code: D0B10	**Engineering Chemistry** **Common to: CE, ME, IT, CSM, CSD**	**L**	**T**	**P**
Credits: 4		**3**	**1**	**-**

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 acquire the knowledge about polymeric materials.
4. To imbibe the basic concepts of petroleum and its products.
5. To acquire required knowledge about engineering materials like Smart materials, and lubricants.

Module I: Water and its treatment   [10 Periods]

Introduction to hardness of water – causes of hardness, expression of hardness, units and types of hardness-Numerical Problems–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. 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 process. Desalination of water-Reverse osmosis.

Module II: Polymeric materials   [10 Periods]

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). Compounding– fabrication of plastics by injection moulding method.
Elastomers: Natural rubber and its vulcanization, Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokol rubber.
Biodegradable polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

Module III: Battery Chemistry & Corrosion   [14 Periods]

A. **Battery Chemistry:** Introduction to Electrochemistry - Classification of batteries- primary (dry cell), secondary (Lead-acid battery) and reverse batteries (Fused electrolyte cells) with examples. Basic requirements for commercial batteries. Construction, working and applications of Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell, Construction and applications of

Hydrogen-Oxygen fuel cell

B. Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism, Types of corrosion: Galvanic, Pitting and water-line corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods. Metallic coatings: Hot dipping (Galvanization).

Module IV:Energy Sources   [10 Periods]

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula–numerical problems. 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. Hydrogen as fuel-production, storage and applications.

Module V: Engineering Materials: [10 Periods]

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

Smart materials and their engineering applications

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

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 B. Rama Devi, P. Aparna and Prasanta Rath, Cengage learning.
2. P. C. Jain and Monica Jain, "A Text Book of Engineering Chemistry", Dhanpat Rai Publications, New Delhi, 16th Edition 2014.
3. S.S. Dara and S.S. Umare, "A Text Book of Engineering Chemistry", S Chand Publications, New Delhi, 12th Edition 2010.
4. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.

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)

Course Outcomes with BLOOM's

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

	Course Outcome	Bloom's Taxonomy Level
CO1	Understand the basic properties of water and its usage in domestic, industrial purposes and purification of water by various methods.	Understand(**L2**)
CO2	Acquire knowledge on electrochemical procedures related to corrosion and apply in its control methods, fuel cells, batteries and their applications.	Apply(**L3**)
CO3	Learn the fundamentals of preparation, properties and engineering applications of polymeric materials in daily life.	Apply(**L3**)
CO4	Acquire the knowledge on various fuels; identify a better fuel source based on calorific value.	Analyze (**L4**)
CO5	Acquire basic knowledge on usages of important engineering materials like cement and lubricants.	Apply(**L3**)

COs	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2				3					3			
CO2	3	2	2				3					3			
CO3	3	3	2				3					3			
CO4	3	2	2				3					3			
CO5	3	3	2				3					3			

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech I Semester		
Code: D0501	**Programming for Problem Solving (Common for CE, EEE, ME, ECE, CSE, CSE (AI & ML), CSE (DS), and IT)**	L	T	P
Credits: 3		3	-	-

Prerequisites: NIL

Course Objectives:

1. Understand the basic terminology, write, compile and debug programs in computer programming
2. Implement different control statements for solving problems.
3. Understand the concept of structured programs and arrays.
4. Implement the idea of strings and pointers.
5. Analyse the usage of structures and different file operations.

MODULE I: Fundamentals and Introduction to 'C' Language   [10 Periods]

Introduction Fundamentals– Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method

Introduction to 'C' Language: – Background, C-tokens- Keywords, Identifiers, Basic data types, Variables, Constants, Preprocessor directives-include, define, Managing Input / Output functions - formatted input / output functions, Operators. Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Simple C Programming examples.

MODULE II: Conditional Statements and Repetition Statements   [09 Periods]

Conditional Statements: Simple if statement, if-else statement, if-elseif- ladder, nested if else, Dangling else problem, switch statements.

Repetition statements – while, for, do-while statements, nested looping, other statements related to looping – break, continue, goto, Simple C Programming examples.

MODULE III: Designing Structured Programs and Arrays   [10 Periods]

Designing Structured Programs-Introduction to function, Advantages, user defined functions; inter function communication-call by value, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion – recursive functions-Towers of Hanoi problem.

Arrays: Basic Concepts, Types of arrays, applications- Selection sort, Bubble sort, Linear search method, arrays and functions.

MODULE IV: Strings and Pointers   [09 Periods]

Strings: Concepts, String Input / Output functions, arrays of strings, string manipulation functions, string conversion, C program examples.

Pointers – Basic Concepts, Pointers for inter function communication-call by reference, pointers to pointers, Pointer arithmetic, array of pointers, pointers to array, applications, pointers to void, pointers to functions, Dynamic memory allocation functions

MODULE V: Structures and File Handling [10 Periods]

Structures – Declaration, definition and initialization of structures, accessing structure elements, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, difference between structures and union, typedef, bit fields, enumerated types, C programming examples.

Files – Basic Concept of a file, file input / output operations, text files and binary files, file status functions (error handling), Random file access functions, command –line arguments. C program examples.

TEXTBOOKS
1. Computer Fundamentals and Programming in C, P. Dey, M Ghosh, Second edition, Oxford University Press.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Eighth Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

REFERENCES
1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning
2. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
3. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

E–RESOURCES
1. http://oxford university press.ac.in/eBooks/ Programming in C.
2. https://www.journals.elsevier.com/science-of-computer-programming
3. http://www.ejournalofsciences.org
4. http://onlinecourses.nptel.ac.in/iiitk_cs-101
5. http://onlinevideolecture.com/ebooks/?subject=C-Programming

Course Outcomes:
At the end of the course, students will be able to
1. Write algorithms and to draw flowcharts for solving problems and translate the algorithms/flowcharts to programs (in C language).
2. Apply different types of control structures to code and test a given logic in C programming language.
3. Decompose a problem into functions and to develop modular reusable code and Use arrays to formulate algorithms and programs for Searching and sorting problems.
4. Develop programs that make use of concepts such as strings, pointers.
5. Analyse structures, file operations and command line arguments.

	CO- PO,PSO Mapping														
	(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	**Programme Outcomes (POs)**													**PSOs**	
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2										1	3	2	2
CO2	3	2	1									1	3	2	1
CO3	3	3	1									1	3	2	1
CO4	3	1										2	3	2	1
CO5	3	3	1									2	3	2	1

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. I Semester		
Code: D0B09	**Applied Physics Lab Common to:** CE, ME, IT, CSM, CSD	**L**	**T**	**P**
Credits: 1		-	-	2

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

1. Capable of handling instruments related to the Hall effect and photoelectric effect experiments and their measurements.
2. 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.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting.

Course Outcomes: The students will be able to:

1. 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.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Gain the knowledge of applications of dielectric constant.
4. Understand the variation of magnetic field and behavior of hysteresis curve.
5. 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. a) V-I and L-I characteristics of light emitting diode (LED)
    b) V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.
9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material
11. a) Determination of the beam divergence of the given LASER beam
 b) Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
12. Understanding the method of least squares — torsional pendulum as an example.

Note: Any 8 experiments are to be performed.

REFERENCE BOOK:

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

COS	CO- PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1Weak											
	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3		2								
CO2	2	2		2								
CO3	1	2		1								
CO4	3	2		2								
CO5	2	1		2								

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B. Tech. I Semester		
Code: D0B11	**Engineering Chemistry Lab** Common to: CE, ME, IT, CSM, CSD	L	T	P
Credits: 1		-	-	2

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

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

List of Experiments:

1. Calibration of Volumetric apparatus.

2. Estimation of Total Hardness of water by EDTA Method.

3. Estimation of an acid by pHmetry.

4. Estimation of strength of an acid by Conductometry.

5. Estimation of strength of an acid by Potentiometry.

6. Determination of viscosity of given liquids by Ostwald's Viscometer.

7. Determination of surface tension of given sample using Stalagmometer.

8. Estimation of iron (II) by Dichrometry.

9. Estimation of acid value of given lubricant oil.

10. Preparation of Bakelite rubber.

Virtual lab experiments:

11. Construction of fuel cell and it's working.

12. Smart materials for biomedical 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. College Practical Chemistry by V. K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

Course Outcomes with BLOOM's

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

	Course Outcome	**Bloom's Taxonomy Level**
CO1	Analyze the hardness of given water samples from different places.	Analyze **(L4)**
CO2	Apply the various instrumental techniques such as conductometry, potentiometry and pH metry to find out the concentrations or equivalence points of acids and bases.	Apply**(L3)**
CO3	Analyze the surface tension, acid value and viscosity of given lubricant oils.	Analyze **(L4)**
CO4	Understand the preparation of polymeric materials like Bakelite.	Understand**(L2)**
CO5	Understand the Construction of fuel cell and it's working. and Smart materials for biomedical applications .	Understand**(L2)**

CO- PO Mapping **(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak**															
COs	**Programme Outcomes(POs)**												**PSOs**		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1				3								
CO2	2	2	2												
CO3	2	2													
CO4	2	2	1												
CO5	2	1	2				1								

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code: D0502	**Programming for Problem Solving Lab**	L	T	P
Credits: 1	**(Common for ALL)**			2

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

Prerequisites: NIL

Course Objectives:

1. Understand the various steps in Program development
2. Identify syntax and semantics of C Programming Language
3. Illustrate the usage of structured programming approach in solving problems.
4. Develop programs that make use of arrays, strings, pointers and structures in C language
5. Analyse different file operations

Simple Basic problems:

a. Write sample examples of C programs to implement basic operations.
b. Write a C program to find smallest and largest of given three numbers
c. Write a C program to find the roots of a quadratic equation.
d. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
5 x 1 = 5
5 x 2 = 10
5 X 3 = 15
e. .Write a C program to find the sum of individual digits of a positive integer

Numeric problems:

a. Write a C program to generate the first 'n' terms of the sequence. [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.]
b. Write a C program to find whether the given number is palindrome.
c. Write a C program to find whether the given number is perfect or not.
d. Write a C program to find whether the given number is Armstrong or not.
e. Write a C program to find whether the given number is strong or not.

f.   Write a C program to generate all the prime numbers between n1 and n2, where n1 and n2 are values supplied by the user.

Arrays and Stings:

a.   Write a C program to perform Addition of Two Matrices
b. Write a C program to perform Multiplication of Two Matrices
c. Write a C program to find both the largest and smallest number in a list of integers
d. Write a C program to search for a key value in a given list of integers using linear search.
e. Write a C program that implements the Bubble sort method to sort a given array of integers in ascending order
f. Write a C program To insert a sub-string into given main string from a given position.
g. Write a C program To delete n characters from a given position in a given string
h.   Write a C program To find substring in a given string
i. Write a C program to determine if the given string is a palindrome or not
j. Write a C program to count the lines, words and characters in a given text

Functions, Pointers and Structures:

a. Write C programs that use both recursive and non-recursive functions to find the factorial of a given integer.
b. Write C programs that use both recursive and non-recursive functions to find the GCD (greatest common divisor) of two given integers.
c. Write a C program to swap two numbers, which implement call by value and call by reference.
d. Write a C program to display the below student details using structures

Roll Number	Name	Gender	Branch	Attendance percentage
501	John	male	CSE	77.3
502	Alice	male	ECE	80.5
503	Sam	Female	IT	90.7

e. Write a C program to find grade of a student using structures

Files and Command Line Arguments:

a. Write a C program to display contents of a file
b. Write a C program which copies one file to another.
c. Write a C program to find sum of two numbers using command line arguments

Miscellaneous:

a. Write a C program to construct number Patterns of numbers as follows:

```
1                    1                    1
1    2               2    2               2    3
1    2    3          3    3    3          4    5    6
```

b. Write a C program to construct star Patterns of numbers as follows:

```
*                   *   *   *   *           *
*   *               *   *   *               *   *
*   *   *           *   *                   *   *   *
*   *   *   *       *                       *   *   *   *
                                            *   *   *
                                            *   *
                                            *
```

c. Write a C program to construct alphabets Patterns of numbers as follows:

```
A                   A                   A
A   B               B   C               B   B
A   B   C           D   E   F           C   C   C
```

Mini Project:

a. Develop a mini project which implement the Library Management System
b. Develop a mini project which implement the Student Record System

Course Outcomes:
At the end of the course, students will be able to:
1. Analyse concepts in problem solving and write diversified solutions for a given problem.
2. Identify situations where computational methods and computers would be useful.
3. Understand the programming tasks using techniques learned and write pseudo-code.
4. Compare the program on a computer, edit, compile, debug, correct, recompile and execute it.
5. Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task

TEXT BOOKS:
a. Computer Fundamentals and Programming in C, P. Dey, M Ghosh, Second edition, Oxford University Press
b. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Eighth Edition, Pearson Education.
c. The C Programming Language, B.W. Kernighan and Dennis Ritchie, PHI/Pearson Education

REFERENCES:
a. C Programming & Data Structures, B.A. Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
b. C for Engineers and Scientists, H. Cheng, Mc. Graw-Hill International Edition

c. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

CO- PO,PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)													PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2										1	3	2	
CO2	3	2	1									1	3	3	1
CO3	2	3	1									1	3	2	1
CO4	3	3	2									1	2	2	3
CO5	3	2	2									1	1	2	3

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)	B.Tech. I Semester		
Code:D0302	ENGINEERING WORKSHOP (Common for ECE,EEE, CE and ME)	L	T	P
Credits: 1		-	-	2

COURSE OBJECTIVES:

To understand the usage of hand tools, acquire the skills in model / pattern making and familiarize with various work materials and tools.

I. TRADES FOR EXERCISES:

At least two exercises from each trade:

    1. Carpentry   2.Fitting   3. Tin-Smithy
    4. House-wiring 5.Foundry 6.Arc welding

II. TRADES FOR DEMONSTRATION & EXPOSURE

1. Machine shop
2. Plumbing
3. Wood working lathe
4. Identification of Electronic Components
5. Black smithy
6. Computer Peripherals

COURSE OUTCOMES

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

1. Knowledge of carpentry process and methods used in the design and fabrication, installation, maintenance and repair of structures and fixtures (e.g., furniture, cabinets) to accomplish work assignments.
2. Assembling together of part and removing metals to secure the necessary joint by using fitting and welding.
3. Understand the hardware components of house wiring.
4. Understand the manufacturing process using machine shop.
5. Analyze the different types of computer Peripherals

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PO1	PO2	PO3
CO1	3				2	2	1		3			3		2	
CO2	3				2	2	1		3			3		2	
CO3	3				2	2	1		3			3		2	
CO4	3				2	2	1		3			3		2	
CO5	3				2	2	1		3			3		2	

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech.II Semester		
Code:D0B02	ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (Common to All)		L	T	P
Credits:4			3	1	-

Pre-requisites: Mathematics knowledge at pre -University level

Course Objectives: To Learn
1) Methods of Solving First order Ordinary Differential Equations and its applications.
2) Methods of Solving Higher order Ordinary Differential Equations and its applications.
3) Laplace Transforms and its applications.
4) Gradient, Divergence, curl and Scalar potential function.
5) Line, Surface and volume integrals, and vector integral theorems.

MODULE I: First Order and First Degree Ordinary Differential Equations   [8 Periods]

Exact Differential Equations, Non-Exact Differential Equations, Linear Differential Equations, Bernoulli's Differential Equations.

Applications: Orthogonal trajectories (Cartesian and polar form), Newton's law of cooling, Law of natural growth and decay.

MODULE II: Higher Order Ordinary Differential Equations with Constant Coefficients

[12 Periods]

Introduction-Homogenous, Non-homogeneous differential equations. Complementary function and Particular integral, Non-Homogeneous terms of the type e^{ax} , sin(ax), cos (ax), polynomial in x, $e^{ax} V(x)$, $x^k V(x)$, Method of variation of parameters.

Applications: LCR Circuit.

MODULE III: Laplace Transforms   [10 Periods]

(A) Laplace Transforms: Laplace transform of standard functions, First shifting theorem, Unit step function, Dirac delta function, second shifting theorem, Laplace transform of functions when multiplied and divided by t. Laplace transforms of derivatives and integrals of functions, Evaluation of integrals using Laplace transforms, Laplace transform of Periodic functions.

(B) Inverse Laplace transform by different methods, Convolution Theorem, Applications: Solving Initial value problems by Laplace transform method. (All the theorems without proof).

MODULE-IV: Vector Differentiation   [8 Periods]

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

MODULE-V: Vector Integration   **[10 Periods]**

Line, Surface and Volume Integrals. Greens Theorem, Gauss Divergence Theorem and Stokes Theorem (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.

REFERENCES:
1) Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, Jogn Wiley & Sons,2006.
2) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Ed, Pearson, Reprint, 2002.
3) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4) Alan Jeffrey, Mathematics for Engineers and Scientists, 6th Edition, 2013, Chapman & Hall.
5) Kanti. B.Datta, Mathematical Methods of Science and Engineering, Cengage Learning.

Course Outcomes: After learning the contents of this course the student must be able to
1. Solveexact and linear differential equations and find orthogonal trajectories of given family of curves.
2. Understand complementary function, particular integral, and Solvesecond and higher order Ordinary Differential Equations.
3. Find Laplace transform of given functions, inverse Laplace transform byconvolution theorem and Solution of ordinary differential equations.
4. Find Gradient, Divergence, curl and Scalar potential function.
5. EvaluateLine, Surface and volume integrals and verify Vector integral theorems.

CO- PO Mapping												
(3/2/1indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2		2	3	2					2	3
CO2	2		3		3	2					2	3
CO3		2		2	3							2
CO4	2		2	2	3	3					2	3
CO5	3		2	2	3							2

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. II Semester	
Code: D0303	ENGINEERING MECHANICS (Common for CE and ME)	**L**	**T**	**P**
Credits: 3		3	-	-

Prerequisites: Nil

COURSE OBJECTIVES:

The objective of this subject is to provide the basic concepts and effect of system forces on rigid bodies, Geometrical Properties of Planes and Solids, problem solving in kinematics and kinetics using different methods and to analyze the types of friction for moving bodies and problems related to friction.

MODULE I: Introduction to Mechanics & System of Forces

Introduction: Basic Concepts, Laws of Motion, Force - types, characteristics - Principle of transmissibility - Types of Forces - Concurrent and non-concurrent Forces - Composition of force – Resultant - Triangle, Polygon and Parallelogram Law of Forces - Moment of Force and its Application -Varignon's theorem, Couples - Free Body Diagrams, Types of Supports and their reactions, Internal and External Forces - Types of Equilibrium, Equations of Equilibrium, Conditions of Equilibrium - Lami's Theorem.

MODULE II: Friction, Centroid and Center of Gravity

Friction: Types of friction, Limiting friction, Laws of friction, static and dynamic friction, application of laws of friction. Motion of bodies - wedge, screw, screw jack.

Centroid and Center of Gravity: Introduction, Centroids of Lines and Areas - simple figures - Centroid of composite figures. Pappus theorem - Centre of gravity of simple solids, composite solids - Centroids of volumes.

MODULE III: Moment of Inertia

A: Area Moment of Inertia: Definition - Moment of Inertia of plane areas, Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures.

B: Mass Moment of Inertia: Introduction-moment of inertia of masses - Radius of gyration-Transfer formula for mass moment of inertia- by integration - Moment of Inertia of composite bodies.

MODULE IV: Kinematics and Kinetics

Kinematics: Rectilinear motion - Motion of Rigid Body under uniform and variable accelerations -motion under gravity- curvilinear motion – Projectiles - rotary motion.

Kinetics: Analysis as a Particle and Analysis as a Rigid Body in Translation -D'Alemberts

Principle - Connected bodies- Kinetics of rotating bodies.

MODULE V: Work, Power, Energy & Mechanical Vibrations

Work, Power and Energy: Introduction, work-energy equation - motion of connected bodies - work done by a spring - general plane motion. Mechanical Vibrations: Definitions, concepts - simple harmonic motion - free vibrations - Simple and compound pendulums.

TEXT BOOKS

1. S. Timoshenko, D.H. Young, J.V. Rao and Sukumar Pati**, "Engineering Mechanics"**, Tata McGraw-Hill Education, 5thEdition, 2013.
2. K.Vijaya Kumar Reddy, J. Suresh Kumar**, "Engineering Mechanics"**, B SPublications, 3rd Edition, 2013
3. Beer, F.P and Johnston Jr. E.R. "**Vector Mechanics for Engineers**", Tata McGraw-Hill Education 10th Edition (India) Pvt Ltd.. 2013.
4. Fedinand. L. Singer, **"Engineering Mechanics"**, Harper & Row Publishers, 3rdEdition, 1975.

REFERENCES

1. R.S. Khurmi, "**A Text Book of Engineering Mechanics"**, S.Chand Publications, 21st Edition, 2007.
2. K L Kumar, "**Engineering Mechanics"**, Tata McGraw Hill Education, 4th Edition, 2011.
3. D.S.Kumar Patil, "**Engineering Mechanics''**, SK Kataria & Sons Publishers, 2ndEdition, 2009.

E - RESOURCES

1. http://www.mathalino.com/reviewer/engineering-mechanics/equilibrium-force-system
2. http://nptel.ac.in/courses/112103109/
3. http://ascelibrary.org/journal/jenmdt
4. https://tll.mit.edu/sites/default/files/SUTDVideoThumb/freebodydiagrams.pdf
5. http://nptel.ac.in/courses/112106180/

COURSE OUTCOMES

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

1. Determine the resultant of a system of forces and draw free body diagrams and can frame appropriate equilibrium equations from the free body diagram.
2. Solve the fundamental static problems and able to determine centroidand centre of gravity.
3. Estimate the moment of inertia of composite area about centroidal or any arbitrary axis

4. Apply fundamental concepts of kinetics and kinematics of particles to the analysis of simple practical problems.
5. Calculate position, velocity and acceleration of particle using principles of kinetics and Work, Power, Energy.

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	3								3	2		
CO2	3	3	1	3								3	2		
CO3	3	3	1	3								3	2		
CO4	3	3	1	3								3	2		
CO5	3	3	1	3								3	2		

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

Programme Outcomes(POs) — PSOs

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. II Semester	
Code: D0203	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (Common for CSM, CSD, IT, CE & ME)	L	T	P
Credits: 3		3	-	-

Prerequisites: Mathematics

Course Objectives:

- To understand concept of electrical circuits and its components.
- To understand Single phase AC circuits.
- To study and understand DC & AC machines .
- To import the knowledge of various Characteristics of various Diodes & Dectifiers
- To import the knowledge of various Characteristics of Transistors and their Operations.

MODULE I: DC Circuits [10 Periods]

D.C.Circuits: Electrical Circuit Elements(R, L and C), Ohms law , Star -Delta & Delta –Star Transformation, Types of Energy Sources, KVL & KCL, Analysis of Simple Circuits (Mesh and Nodal Analysis) with DC excitation only. Superposition, Thevenins and Maximum Power Transfer Theorems with DC excitation only.

MODULE II:

AC Circuits : [10 Periods]

Representation of sinusoidal waveforms, Average & RMS values, Phasor representation, real power, reactive power, apparent power & power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series)-Simple problems.

MODULE III: Introduction to Electrical Machines [10 Periods]

A: DC Machines: Construction & Principle of Operation of DC Generators – E.M.F Equation. Principle of operation DC Motors – Back E.M.F. - Torque equation –simple problems

B: AC Machines: Construction and Principle of operation of Transformer- EMF Equation. Construction and Principle of Operation of 3 Phase Induction Motors – simple problems

MODULE IV: P-N Junction Diode [10 Periods]

P-N Junction Diode: Formation of PN junction Diode, Types of Biasing, Volt-Ampere characteristics, Ideal versus practical, Static and dynamic resistances, Zener diode operation, Zener diode as voltage regulator.

Rectifiers: Half Wave Rectifier, Full Wave Rectifier- Centre tap and Bridge rectifier.

Filters: Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

MODULE V: BJT and Junction Field Effect Transistor (JFET) [10 Periods]

Bipolar Junction Transistor (BJT): Construction & Principle of Operation, Symbol, Transistor as a amplifier, Common Base, Common Emitter and Common Collector Configurations, Input-Output Characteristics of CB , CE & CC , Comparison of CE, CB and CC configurations

Junction Field Effect Transistor : Construction & Principle of Operation,Symbol, Drain -Transfer Characteristics, Comparison of BJT and JFET.

TEXT BOOKS

1. M.Surya Kalavathi, Ramana Pilla, Ch. Srinivasa Rao, Gulinindala Suresh, "Basic Electrical and Electronics Engineering", S.Chand and Company Limited, New Delhi, 1st Edition, 2017.
2. R.L.Boylestad and Louis Nashlesky, "Electronic Devices & Circuit Theory", Pearson Education, 2007.

REFERENCES

1. V.K. Mehtha and Rohit Mehta, "Principles of Electrical Engineering and Electronics", S.Chand& Co., 2009.
2. Jacob Milliman, Christos C. Halkias, Satyabrata Jit (2011), "Electronic Devices and Circuits", 3rd edition, Tata McGraw Hill, New Delhi.
3. Thomas L. Floyd and R. P. Jain, "Digital Fundamentals", Pearson Education, 2009.
4. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 2008.
5. Nagrath I.J. and D. P. Kothari, "Basic Electrical Engineering", Tata McGraw Hill, 2001.
6. Mittle N., "Basic Electrical Engineering", Tata McGraw Hill Education, New Delhi, 2nd Edition, 2005.

Course Outcomes:

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

1. Analyze electrical circuits by applying basic laws.

2. Analyze Single Phase AC circuits.

3. Analyze the performance of DC Motor, Three phase Induction motor and Transformer.

4. Understand Characteristics of various Diodes & Rectifiers.

5. Differentiate the Transistors and their Operations.

Course Outcomes	Programme Outcomes (POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	0	1	0	0	0	2	0	2	2
CO2	3	2	1	0	3	1	0	1	1	2	1	2
CO3	3	2	1	1	3	2	0	0	1	0	2	2
CO4	3	2	1	0	3	1	0	1	1	2	1	2
CO5	3	2	1	1	3	2	0	0	1	0	2	2

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. II Semester	
Code: D0301	ENGINEERING GRAPHICS (Common for CE and ME)	**L**	**T**	**P**
Credits: 3		1	-	4

Prerequisites: Nil

Course Objectives: To develop in students, graphic skills for communication of concepts and Ideas of engineering products.

MODULE I: Introduction to Engineering Drawing, Scales and Curves Introduction to

Engineering Drawing: Principles of Engineering Graphics andtheir significance. Lettering and dimensioning. Geometrical Constructions: Regular polygons only.
Scales: Plane scale, Comparative Scale, Diagonal Scale, Vernier Scale
Curves: Conic Sections, Cycloidal Curves and Involutes.

MODULE II: Projection of Points, Lines and Planes

Projection of Points: Principles of Orthographic Projections – Conventions – Firstand Third Angle projections. Projection of points including all four quadrants.

Projection of Lines: Projection of Lines - parallel, perpendicular, inclined to one reference plane and inclined to both reference planes. True length and true angle of a line.

Projection of Planes: Projection of Planes - Axis inclined to one reference plane.

MODULE III: Projection of Solids, Section of Solids and Development of Surfaces

A. **Projection of Solids**: Projections of regular solids like cube, prism, pyramid, cylinder and cone by rotating object method. Axis inclined to one reference plane.
B. **Section of Solids**: Sectioning of single solid with the cutting plane inclined to one plane and perpendicular to the other - true shape of section.
   Development of Surfaces: Development of lateral surfaces of simple Solids.

MODULE IV: Isometric Projections and Transformation of Projections
Isometric Projections: Principles of Isometric Projection – Isometric Views– Conventions –Plane Figures, Simple Solids.
Transformation of Projections: Conversion of Isometric Views to Orthographic Viewsand vice versa– simple objects.

MODULE V: Introduction to Computer Aided Drafting
CAD workstation, Advantages of CAD, CAD Software, AutoCAD – Opening and Creating Drawings-Exploring the AutoCAD interface-Zooming and Panning, AutoCAD Commands and Toolbars-Basic Drawing and Editing Commands.

TEXT BOOKS

1. K.L.Narayana, S.Bheemanjaneyulu "**Engineering Drawing with Auto CAD-2016**" NewAge International Publishers, 1st Edition, 2018.
2. N.D. Bhat, "**Engineering Drawing**", Charotar Publishing House, 53rd Edition, 2014.

REFERENCES

1. K.L.Narayana, P.Kannaiah, "**Engineering Drawing**", SciTech Publishers. 2nd Edition, 2017
2. K.Venugopal,"**Engineering Drawing**",NewAge International Publishers, 3rd Edition, 2014.
3. K. V. Natarajan, "**A text book of Engineering Graphics**", Dhanalakshmi Publishers, 2015.
4. M.S. Kumar, "**Engineering Graphics**", D.D. Publications, 2011.
5. Trymbaka Murthy, "**Computer Aided Engineering Drawing**", I.K. International Publishing House, 3rd Edition, 2011.

E - RESOURCES

1. https://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing
2. https://www.wiziq.com/tutorials/engineering-drawing
3. http://freevideolectures.com/Course/3420/Engineering-Drawing
4. http://www.worldcat.org/title/journal-of-engineering-graphics/oclc/1781711
5. http://road.issn.org/issn/2344-4681-journal-of-industrial-design-and-engineering-graphics
6. http://nptel.ac.in/courses/112103019/

Course Outcomes:
At the end of the course students will be able to
1. Apply the concept of engineering scales and understand the application of various engineering curves.
2. Demonstrate the concept of projection of line for various engineering application.
3. Prepare orthographic and sectional orthographic views of any given object and comprehend the drawings to extract complete information of the object.
4. Produce development of surface and isometric projections.
5. Create 2D and 3D engineering drawings by using AutoCAD software.

COS	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1		1					3		3	2		
CO2	3		1		1					3		3	2		
CO3	3		1		1					3		3	2		
CO4	3		1		1					3		3	2		
CO5	3		1							1		1			

Table title: **CO- PO,PSO Mapping** (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

ENGLISH FOR SKILL ENHANCEMENT

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.

UNIT - I

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

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 Black Swan, 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 ReportsFormats- 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*
are coveredin the syllabus of ELCS Lab Course.

➢ **Note: 1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for*
 *BTec.h 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 NEP 2020, teachers are requested to be
 flexible toadopt 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 BOOK:
 1. "English: Language, Context and Culture" by Orient Black Swan 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.

Course Outcomes with BLOOM's

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

	Course Outcomes	**Bloom's Taxonomy**
CO1	Understand the importance of vocabulary and sentence structures.	Understand (L3)
CO2	Choose appropriate vocabulary and sentence structures for their oral and writtencommunication.	Apply (L3)
CO3	Demonstrate their understanding of the rules of functional grammar.	Understand (L2)
CO4	Develop comprehension skills from the known and unknown passages.	Apply (Level3)
CO5	Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports invarious contexts.	Apply (Level4)
CO6	Acquire basic proficiency in reading and writing modules of English.	Apply (Level3)

| | **CO-PO Mapping**
(3/2/1/ indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak |
| COs | \multicolumn{14}{c}{**Programme Outcomes (Pos)**} | PSOs |
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	2	2	3	-	2	-	-	-
CO2	-	-	-	-	-	-	-	-	-	3	2	-	-	-	-
CO3	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	1	2	-	2	-	2	-	-	-
CO5	-	1	1	-	-	-	1	-	-	2	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	1	1	-	-	-	-	-

COURSE OBJECTIVES:

The objective of this subject is to provide the basic concept of force, moment of inertia, reaction and moments by practically.

List of Experiments

1. Verify the triangle law and polygon law of forces.
2. To find the equilibrium of coplanar concurrent force system-forces in the jib crane.
3. To determine the support reaction for a beam.
4. To determine the moment of inertia of a flywheel.
5. To verify the law of moments by disc apparatus.
6. To determine the coefficient of friction.
7. To verify the equilibrium of Non Concurrent forces.
8. To verify the equilibrium of forces using force table.
9. To determine the efficiency of a simple screw jack apparatus.
10. To estimate the value of acceleration due to gravity by using compound pendulum.
11. To determine the efficiency of Worm and Worm Wheel apparatus.
12. To determine the efficiency of a Differential Wheel and Axle apparatus.

COURSE OUTCOMES

At completion of the course, students will be able to

1. Use scalar and vector analytical techniques for analyzing forces in statically determinate structures.
2. Apply basic knowledge of mathematics and physics to solve real-world problems.
3. Determine the coefficient of friction.
4. Determine the efficiency of a simple screw jack apparatus, Worm and Worm Wheel apparatus and Differential Wheel and Axle.
5. Estimate the value of acceleration due to gravity.

COs	Programme Outcomes(POs)												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	3					3			2	2		
CO2	3	1	1	3					3			2	2		
CO3	3	1	1	3					3			2	2		
CO4	3	1	1	3					3			2	2		
CO5	3	1	1	3					3			2	2		

CO- PO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

2024-25 Onwards (MR-24)	MALLA REDDY ENGINEERING COLLEGE (Autonomous)		B.Tech. II Semester		
Code: D0204	**Basic Electrical and Electronics Engineering Laboratory** (Common for CSM, CSD, IT, CE & ME)		**L**	**T**	**P**
Credits: 1			-	-	2

Prerequisites: Basic Electrical and ElectronicsEngineering

Course Objectives:

To get practical knowledge about basic electrical circuits, the performance of DC Motors, AC Motors and Transformers. Electronic devices like Diodes, BJT, JFET.

List of Experiments:

PART-A(Compulsory)

1. Verification of Kirchhoff's Laws.
2. Verification of Maximum Power Transfer Theorem.
3. Determination of Phase Angle for RC Series Circuit
4. Brake Test on DC-Shunt Motor. Determination of Performance curves
5. Load Tests on Single Phase Transformer
6. V-I Characteristics of PN junction Diode
7. V-I Characteristics of Zener Diode
8. Input and Output characteristics of BJT with CE configuration

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

1. Verification of Superposition theorem.
2. Brake Test on Three Phase Induction Motors. Determination of Performance curves
3. Half Wave &Full Wave rectifier without filters.
4. Input and Output characteristics of BJT with CB configuration
5. Drain -Transfer Characteristics of JFET.

Course Outcomes:

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

1. Analyze electrical circuits by applying basic laws
2. Analyze Single Phase AC circuits
3. Analyze the performance of DC Motor, three phase Induction motor and transformer
4. Understand Characteristics of various diodes & rectifiers
5. Differentiate the Transistors and their Operations

CO- PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak														
COs	Programme Outcomes (POs)												PSOs		
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2		3		3				1		1	2	2	1	
CO2	2		2		3							1	1		
CO3	2		2		2							3			2
CO5	2		2		3							1	1		
CO5	2		2		2							3			2

Prerequisites: Programming for Problem Solving

Course Objectives:
☐ To install and run the Python interpreter
☐ To learn control structures.
☐ To Understand Lists, Dictionaries in python
☐ To Handle Strings and Files in Python

Software Requirements: Python

List of Programs:

1. a) Write a program to demonstrate different number data types in Python.
   b) Write a program to perform different Arithmetic Operations on numbers in Python.
2. a) Write a program to create, concatenate and print a string and accessing sub-string from a given string.
   b) Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017"
3. Write a program to create, append, and remove lists in python.
4. Write a program to demonstrate working with tuples in python.
5. Write a program to demonstrate working with dictionaries in python
6. a) Write a python program to find largest of three numbers.

   b) Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [Formula: c/5 = f-32/9]

7. a) Write a Python script that prints prime numbers less than 20.

   b) Write a python program to find factorial of a number using Recursion

8. a) Write a python program to define a module to find Fibonacci Numbers and import the module to another program.

   b) Write a python program to define a module and import a specific function in that module to another program.

9. a) Write a program that defines and print a matrix.

   b) Write a program to perform addition of two square matrices.

   c) Write a program to perform multiplication of two square matrices.

10. a) Write a function dups to find all duplicates in the list.
    b) Write a function unique to find all the unique elements of a list
11. a) Write a program to print each line of a file in reverse order.
    b) Write a program to compute the number of characters, words and lines in a file.

12. Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.

TEXT BOOKS

1. Supercharged Python: Take your code to the next level, Overland

2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS
1. Python for Data Science, Dr. Mohd. Abdul Hameed, Wiley Publications - 1st Ed. 2021.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
3. Python Programming: A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
5. Think Python, Allen Downey, Green Tea Press
6. Core Python Programming, W. Chun, Pearson
7. Introduction to Python, Kenneth A. Lambert, Cengage
8. Python Programming, Raghunadh P. and Rajaram J, First Edition, AP, 2024

Course Outcomes:
After completion of the course, the student should be able to:
1. Develop the application specific codes using python.
2. Understand Strings, Lists, Tuples and Dictionaries in Python
3. Verify programs using modular approach, file I/O

CO- PO,PSO Mapping															
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs)													PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		3		1							1	2	1	
CO2			2	1	1							1	1		
CO3			2	1	1							1			2

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

Course Objectives:
- ✓ To facilitate computer-assisted multi-media instruction enabling individualized and independent 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 Englishby 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, group discussionsand interviews

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 the LSRWskills 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 professional contexts
- 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**

Skills Lab.**Exercise – I**

CALL 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 –II

CALL 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 pattern insentences – Intonation - *Testing Exercises*

ICS Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication.
Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests andSeeking Permissions - Telephone Etiquette.

Exercise – III

CALL 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 – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise – IV
CALL 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 – V
CALL 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 following specifications:
   i) Computers with Suitable Configuration
   ii) High Fidelity Headphones

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

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 University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge
- University Press. 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
6. Cambridge IELTS by Cambridge University Press
7. How to prepare for the TOEFL Ibt 12th edition by Pamela. J. Sharp, Galgotia Publications
8. The GRE for Dummies 2nd edition by Suzee Vik, Comdex computer publishing.

Course Outcomes with BLOOM's

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

	Course Outcomes	Bloom's Taxonomy
CO1	Understand the nuances of English language through audio-visual experience and groupactivities	Apply (L3)
CO2	Neutralise their accent for intelligibility	Apply (L3)
CO3	Speak with clarity and confidence which in turn enhances their employability skills	Apply (L2)

CO-PO Mapping															
(3/2/1/ indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (Pos)														PSOs
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-
CO2	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	2	2	3	-	-	-	-	-