R G M COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
NANDYAL-518501, KURNOOL DIST., A.P., INDIA

DEPARTMENT OF
MECHANICAL ENGINEERING (ME)

(ESTD-1995)

I & II B.TECH SYLLABUS 2020

Applicable for students admitted into
B.Tech (Regular) from 2020-2021
B.Tech (Lateral Entry Scheme) from 2021-22
REGULATIONS, Course Structure & Detailed Syllabus

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R G M COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABI
B.Tech. (Regular) from 2020-21 and B.Tech. (Lateral Entry Scheme) from 2021-22

For pursuing four year Bachelor Degree Program (under graduate) of study in Engineering (B.Tech.), Two year Master (post graduate) Degree of study in Engineering (M.Tech.), Two year Master (post graduate) degree of study in Business Administration (MBA), Two-year Master (post graduate) Degree of study in Computer Applications (MCA) offered by Rajeev Gandhi Memorial College of Engineering and Technology, Nandyal -518501 under Autonomous status and herein referred to as RGMCET (Autonomous).

All the rules specified herein approved by the Academic Council will be in force and applicable to students admitted from the Academic Year 2020-21 onwards. Any reference to "Institute" or "College" in these rules and regulations shall stand for Rajeev Gandhi Memorial College of Engineering and Technology (Autonomous).

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

The candidate seeking admission into the first year of study of four year B.Tech degree Program should have:

i) Passed either Intermediate Public Examination (IPE) conducted by the Board of Intermediate Education, Andhra Pradesh with Mathematics, Physics and Chemistry as optional subjects (or any equivalent examination certified by Board of Intermediate Education) or a Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Andhra Pradesh (or any equivalent examination certified by State Board of Technical Education) for admission.

ii) Secured a rank in the EAMCET examination conducted by AP State Council for Higher Education (APSCHE) for allotment of a seat by the Convener, EAMCET, for admission.

Admission Procedure:

As per the norms of A.P. State Council of Higher Education (APSCHE), Government of Andhra Pradesh, admissions are made to the first year of Four year B.Tech. Degree program as follows:-

a) As per the norms of Government of Andhra Pradesh, A-Category (based on the rank obtained in EAMCET) seats will be filled by the Convener, EAMCET.

b) As per the norms of Government of Andhra Pradesh, B-Category seats will be filled by the management.

Admission to the Second year of Four year B.Tech. Degree Program in Engineering:

i) Candidates qualified in ECET and admitted by the Convener, ECET, in such cases for admission, when needed permission from the statutory bodies is to be obtained.

ii) 10% of the sanctioned strength in each program of study (of RGMCET) shall be filled by the Convener, ECET as lateral entry.

List of Programs offered

1. B.Tech – Regular & Lateral Entry
2. M.Tech – Regular
3. MBA – Regular
4. MCA – Regular

Academic Regulations for 2020-21 B. Tech. (Regular)

(Effective for the students admitted into the I year from the Academic Year 2020-2021)

The B.Tech. Degree be conferred by the Jawaharlal Nehru Technological University Anantapur, Anantapuramu, students who are admitted to the program and fulfill all the requirements for the award of the Degree as specified below:

1.0 Award of B.Tech. Degree

1.1. The student will be declared eligible for the award of the B. Tech. degree if he fulfils the following academic regulations:

1.2. Pursued a course of study for not less than prescribed course work duration and not more than double the prescribed course work duration.

1.3. Registered for 160 credits and secured 160 credits with compulsory subjects as listed i

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Table 1: Compulsory Subjects

S.No	SUBJECT PARTICULARS		
1	All the subjects offered in B.Tech course / MOOCs	7	Technical Seminar
2	Mandatory Learning Courses [Environmental Science, Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge]	8	2 months Internships-Two
3	All practical subjects	9	6 Month internship
4	All Skill Development Courses/ value added courses	10	Main Project Work
5	Comprehensive Viva-Voce	11	Universal Human values as credit Couse
6	Environmental Sciences, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses.		

2.0 Forfeit of seat

Students, who fail to fulfill all the academic requirements for the award of the degree within **eight academic years** from the year of their admission, shall forfeit their seat in B.Tech. Course.

3.0 Courses of study

The following courses of study are offered at present as specializations for the B.Tech. Course: and any other course as approved by the authorities of the University from time to time.

1) **Civil Engineering**
2) **Computer Science and Engineering**
3) **Computer Science and Engineering(Data Science)**
4) **Computer Science and Engineering and Business Systems**
5) **Electrical and Electronics Engineering**
6) **Electronics and Communication Engineering**
7) **Mechanical Engineering**

Table 2: Credits

Subject		Code	Semester			
			Periods/ Week	Credits	Internal Marks(IM)	External Marks(EM)
Theory			2+1*	03	30	70
Mandatory Learning Courses. (Internal Evaluation)			02	00	30	70
Mini project/Practical			03	1.5	25	50
Drawing			1+4P	03	30	70
Skill Development Courses/Value Added Course (Internal Evaluation)			1+2*	02**	30	70
Summer Internship 2 months (Mandatory) after second year(to be evaluated during V Semester)			00	1.5	00	Certificate from Internship Agency
Industrial/Research Internship 2 months (Mandatory) after third year(to be evaluated during VII Semester)			00	1.5	00	Certificate from Internship Agency
Comprehensive Viva (CV) in VII Semester			--	1.5	00	50
Major Project	Project work	PROJ		06	50	100
	Technical Seminar			01	25	50
6 Months Internship	Internship in Industry			05	00	Certificate from Internship Agency/Industry

*Tutorial

** [Skill Development / value Added Courses/ Mandatory Learning Courses credits will not be considered for the award of division. However, all these courses have to be cleared through internal evaluation by scoring minimum of 40% marks. The credits obtained in Skill development courses will be taken in to account for the award of degree.]

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Note: - EAA will not carry any credits but attendance requirements of 75% should be fulfilled otherwise they have to reregister to fulfill academic requirements.

4.0 Distribution and Weightage of Marks

4.1. The performance of the student in each semester shall be evaluated subject –wise with a maximum of 100 marks for theory and 75 marks for practical subject. In addition, mini-project, Comprehensive Viva-Voce (CV) shall be evaluated for 50 marks each and the project work shall be evaluated for 100 marks.

4.2. For theory subjects, the distribution shall be 30 marks for Internal Evaluation (20 marks for internal test and 10 marks for assignment or field work/group task / online test) and 70 marks for the End-Examination.

4.3. During the semester there shall be 2 tests for theory subjects. In each Internal test there shall be one compulsory (short answers) question and 3 descriptive questions are to be answered. The duration of internal test will be for 2 hours. First test to be conducted in 3 units and second test to be conducted in the remaining 3 units of each subject. For awarding of 20 Internal marks the performance of the student in two Internal examinations conducted one in the middle of the semester and the other towards the end of the semester giving a weight age of 0.75 for the better score and 0.25 for the other score will be considered. There shall be two assignments (***only online submission of Assignments will be accepted***) in each subject (problem based/ field work/group task/Online test) for award of 10 marks so that internal Component (marks) will be 30 marks (20 marks for internal test+10 marks for assignments / field work/group task). ***Out of these two internal tests one internal test for 20 marks will be conducted in online mode.***

Table 3: Units for Internal Tests

Semester	
3 Units- First Internal test	3 Units- Second Internal test

4.4. In the case of Skill Development Courses/ Mandatory Learning courses, two Internal examinations shall be conducted one in the middle of the semester and the other at the end of the semester for 30 marks and the marks scored by the student in these exams with a weight age of 0.75 for better score and 0.25 for the other score will be awarded as Internal marks for 30. For the remaining 70 marks an end examination will be conducted along with other theory examinations. However skill development courses/Value added courses/ Mandatory Learning Courses, end examination will be evaluated internally.

4.5. No makeup test for internal examination or assignments/group tasks will be conducted in any subject or practical. The student, who is absent for any test shall be deemed to have scored zero marks in that subject.

4.6. Open and Professional Electives will commence from 3rd year first semester onwards. The open elective offered in 3-1 semester will be based on self-study/MOOCs. All the students have to opt for the MOOCs (Self Study) and should acquire the required credits. If the student fails to opt for MOOCs, (Under unavoidable circumstances) he/she has to write two internal tests besides the end examination conducted by the institute (Elective offered in place of MOOCs by the Dept.) like other subjects. However, he/she has to obtain the certificate from the organization in which he has registered. Any MOOCs course selected by the student should be of more than 45 hours duration / 12 weeks course with a minimum of 3 credits and also from the reputed organization. Attendance of the student who has opted for MOOCs will be taken from the remaining subjects and labs only in that semester while finalizing the attendance for fulfilling the minimum requirements of attendance for promotion to the next semester. Attendance will not be recorded for MOOCs.

{Massive open online Courses (MOOCs') B.Tech students can avail the facility of earning up to a maximum of 5% credits of their degree requirements through MOOCs. MOOC courses eligible for this purpose are the courses offered by NPTEL / SWAYAM / EDX / Course by any other reputed organisation approved by the department only. The student shall obtain prior approval of the Head of the Department before registering for MOOC's. MOOC courses can be taken in lieu of Elective courses such as Open Electives & Professional Electives (pertaining to their branch only) and Employability Enhancement Courses. No Core, Lab or Project Course can be dropped in lieu of MOOC. The student shall submit course Title, institute which offered MOOC, Examir
Credits of the Course, duration of course. After deciding on the MOOC and a course w

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as its equivalent in the curriculum a student can enrol for it and clear it any time as per his/her convenience and obtain the assessment certificate.

If the assessment certificate is submitted

i) Before the commencement of the semester in which the equivalent course is offered, the student will be exempted from attending the regular class work and internal assessment exams of the equivalent subject.

ii) During the semester the student is permitted to withdraw from the remaining part of the course work and internal assessment tests.

iii) After the semester is over but before the results of that semester are declared the student can request for considering his performance in the MOOC in lieu of its equivalent.

The student shall submit to the HOD the original certificate issued by MOOC authorities along with a photocopy of the same. The original will be returned after verification and verification shall be certified by the Head of the Department on the photocopy which shall be kept in records. An equivalent Grade corresponding to grade/marks awarded by MOOC agency shall be determined by a committee consisting of Principal, Controller of Examinations, Dean Student affairs and HoD concerned. This equivalent Grade shall be shown in the grade sheet and accounted in the SGPA and CGPA calculations.

4.7. Gap Year – Concept of student Entrepreneur in Residence shall be introduced and the outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I/II/III year to pursue full time entrepreneurship. This period may be extended for another one year (two years in total) and this period would not be counted for the maximum duration for completion of graduation. An evaluation committee shall be constituted to evaluate the proposal submitted by the student and committee shall decide on permitting the student for having the Gap Year. The committee consists of Principal as Chairman and all HODs as members.

4.8. In the open electives offered from III year I Sem onwards Student has to select the subjects among the list of open elective subjects by the other departments (inter - department). Student has to clear the subject as per norms to get the required credits. At least minimum of 40 students should register for any open elective; otherwise that open elective will not be offered.

4.9. Out of the professional electives offered from III Year I Semester onwards again one Professional elective in IV Year I Sem will be a MOOCs (Self Study) and the student has to acquire the required credits to clear the subject as specified in 4.6.

4.10. There shall be mandatory student induction program for freshers, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept. / Branch & Innovations etc., shall be included in the guidelines issued by AICTE.

4.11. All undergraduate students shall register for Extra - Academic Activity (EAA) such as a)NCC/NSS b) Games and Sports c) Yoga/Meditation d) Extension Activities e) Literary/ Cultural Activities and f) any other which may be offered in future. A student will be required to participate in an activity for two hours in a week during second and third semesters. The activities shall be carried out in the allotted hours. The activities will be monitored by the respective faculty in charge, senior faculty member of the department and the Department HOD. Grades will be awarded on the basis of participation, attendance, performance and behavior. Grades shall be entered in the marks statement as GOOD, SATISFACTORY and UNSATISFACTORY and shall not be counted towards CGPA calculation. If any student gets an Unsatisfactory Grade, he / she has to repeat the activity in the immediate subsequent Semester / year.

4.12. Courses like Environmental Sciences, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses. ***Universal Human Values course*** shall be included in the curriculum as credit course in place of any open elective as per the convenience of department.

4.13. Students shall undergo **two mandatory summer internships for a minimum of two months** duration at the end of **second and third** year of the Programme. There shall also **months internship** in the **final semester** of the Programme along with the project work

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4.14. **Curricular Framework for Skill oriented**

i) For skill oriented/skill advanced course, one theory and 2 practical hours or two theory hours may be allotted as per the decision of concerned BOS.

ii) Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature. (See Annexure 1 for model skill courses)

iii) A pool of interdisciplinary job-oriented skill courses shall be designed by a common Board of studies by the participating departments/disciplines and the syllabus along with the pre requisites shall be prepared for each of the laboratory infrastructure requirements. The list of such courses shall be included in the curriculum structure of each branch of Engineering, so as to enable the student to choose from the list.

iv) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies /APSSDC or any other accredited bodies as approved by the concerned BoS.

v) The Board of studies of the concerned discipline of Engineering shall review the skill advanced courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest courses based on industrial demand.

vi) If a student chooses to take a Certificate Course offered by industries/Professional bodies/ APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency/professional bodies as approved by the Board of studies.

vii) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the concerned Board of Studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.

viii) A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades. The recommended conversions and appropriate grades/marks are to be approved by the University/Academic Council.

4.15. **Curricular Framework for Honours Programme**

i) Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

ii) A student shall be permitted to register for Honors program at the beginning of 4^{th} semester provided that the student must have acquired a minimum of 8.0 SGPA up to the end of 2^{nd} semester without any backlogs. In case of the declaration of the 3^{rd} semester results after the commencement of the 4^{th} semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

iii) Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

iv) In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

v) Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.

vi) It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and adv

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vii) The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

viii) Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component. (Model pool list is enclosed in the Annexure-2)

ix) MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the university/academic council.

x) The concerned BoS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

xi) If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

xii) In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xiii) Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

4.16. **Curricular Framework for Minor Programme:**

i) a) Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering

b) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

ii) The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE, CE, ME etc. or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.

iii) The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BoS.

iv) There shall be no limit on the number of programs offered under Minor. The University/Institution can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

v) The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

vi) A student shall be permitted to register for Minors program at the beginning of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) up to the end of 2nd semester w[illegible] of backlogs. It is expected that the 3rd semester results may be announced after th[illegible] of the 4th semester. If a student fails to acquire 8 SGPA up to 3rd semester or fai[illegible]

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courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

vii) A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

viii) Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

ix) In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academic council.

x) Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

xi) A committee should be formed at the level of College/Universities/department to evaluate the Grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

xii) If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

xiii) In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xiv) Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

INDUSTRIAL COLLABORATIONS (CASE STUDY)

University-Industry linkages refer to the interaction between firms and universities or public research centers with the goal of solving technical problems, working on R&D, innovation projects and gathering scientific as well as technological knowledge. It involves the collaboration of Industries and Universities in various areas that would foster the research ecosystem in the country and enhance growth of economy, industry and society at large.

The Universities/Institutions (Autonomous) are permitted to design any number of Industry oriented minor tracks as the respective BoS feels necessary. In this process the Universities/Institutions can plan to have industrial collaborations in designing the minor tracks and to develop the content and certificate programs. Industry giants such as IBM, TCS, WIPRO etc., may be contacted to develop such collaborations. The Universities/Institutions shall also explore the possibilities of collaborations with major Industries in the core sectors and professional bodies to create specialized domain skills.

4.17. All the students have to undergo three mandatory internships namely i) Summer internship (During 2nd year break) ii) Industrial/ Research internship (During 3rd year break) and iii) 6 m (During 8th Semester) The student has to (mandatory) undergo summer internship i

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break in a reputed organization for two month. The finalization of the internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the Principal for approval. The outcome of the summer internship will be evaluated during the 5th semester which carries 1.5 credits. The student has to undergo research/ industry internship in III year –II Semester break for a period of two months in a reputed organization. The finalization of the summer internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the Principal for approval. The outcome of the research/industry internship will be evaluated during 7th semester which carries 3 credits. The student has to undergo 6 months internship in IV year –II Semester for a complete period of 6 months in a reputed organization. The finalization of the summer internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the Principal for approval. The outcome of the research/industry internship will be evaluated during 7th semester which carries 3 credits. Certificate from the organization has to be submitted to this effect attested by HoD and Internship in charge to the academic section before the commencement of 3-2 semester.

4.18. The medium of instruction for all Course work, Examination, Seminar Presentations, Project Reports and all academic activities shall be English.

5.0 Question Paper Pattern

5.1. Each Internal Test question paper shall contain 5 questions, of which the First question is compulsory and three questions are to be answered from the remaining four. Compulsory question carries 5 marks (It contains 5 questions of one marks - no choice in first question). The remaining 3 questions carry 5 marks each. Each question shall have a,b,c.... parts.

5.2. The End Examination question paper will have 7 questions and students have to answer5 questions. However, the first question is compulsory and it consists of 7 short answer questions, each carrying 2 marks. The next 4 questions are to be answered from the remaining 6 questions and each carries 14 marks. Each 14 marks question shall have a, b, c .. parts. Evaluation of answer scripts shall be done by either Internal or External examiners appointed by the Principal. A minimum of 50% of subjects will be evaluated by external examiners.

5.3. For practical subjects, there shall be a continuous evaluation during the semester for 25 internal marks and End Examination carries 50 marks. Of the 25 marks for Internal, 15 marks shall be awarded for day-to-day work, 5 marks to be awarded by conducting an internal laboratory test and 05 marks will be allotted for any creativity/ innovation/ additional learning in lab beyond prescribed set of experiments etc. The End Examination shall be conducted by the teacher concerned and an external Examiner from other institutions.

5.4. For the subject having design and/or drawing, (such as Engineering Graphics, Machine Drawing etc.) and estimation, the distribution shall be 30 marks for Internal evaluation (15marks for day-to-day work and 5 marks for Internal tests and 10 marks for assignments) and 70 marks for End Examination. There shall be two internal tests in a Semester and the better of the two shall be considered for the award of marks for internal tests.

5.5. The Engineering drawing, wherever offered is to be treated as a theory subject. Evaluation method adopted for theory subjects shall be followed here as well.

5.6. There shall be comprehensive Viva-Voce examination at the end of 7th semester. Comprehensive Viva Examination shall be conducted by the committee consisting of senior faculty (based on the recommendation of HOD), an external Examiner from other institutions and HOD and evaluated for 50 marks.

5.7. The project topic should be approved by Internal Department Committee (IDC) / Identified by organization where the student is carrying out 6 months internship. Out of total 150 marks for the project work, 50 marks shall be for Internal Evaluation and 100 marks for the End Semester Examination. The evaluation of project work shall be conducted at the end of the IV year II semester. The external project viva voce examination will be conducted by the committee consisting of an external Examiner from other institute, Head of the Department and the supervisor of the project. The Internal evaluation for 50 marks shall be on the basis of one technical seminars (25 marks) and remaining 25 for main project related activities. The Internal evaluation of the project work for 50 marks shall be conducted by the committee consisting of head of the Department or his nominee, senior faculty member and the supervisor of project.

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5.8. For all practical /mini project/main project/CV etc. the HOD of the concerned dept. shall submit a panel of 4 external examiners from different institutes and one will be selected by the Chief Superintendent of the Examination for conducting of end examination.

5.9. **Revaluation of End Examination Scripts**: Revaluation of End Examination scripts is allowed for theory subjects only by paying requisite fee. Procedure for Revaluation: The script will be revaluated by an examiner appointed by the Principal. The maximum of revaluation and regular end examination grade will be awarded for that subject. Student can apply for revaluation in a subject only once.

Table4: Distribution of weightages for examination and evaluation

S.No	Nature of subject	Marks	Type of examination and mode of assessment		Scheme of Examination
1	Theory	70	End Examination. Both internal and external Evaluation(at least a minimum of 50% subjects will be sent for external evaluation)		End Examination in theory subjects will be for 70 marks.
		30	20	Internal Examinations (Internal evaluation)	These 20 marks are awarded to the students based on the performance in two (per semester) Internal examinations with a weightage of 0.75 for better score and 0.25 for the other score.
			10	Assignments/Field work/Group task/Online Test	Average of two assignments /Field work/group task in a semester each evaluated for 10 marks.
2	Practical / Mini Project Work	50	End lab examination (External evaluation)		This End Examination in practical subjects will be for a maximum of 50 marks.
		25	15	Internal evaluation	Day-to-day performance in lab experiments and record.
			05	Internal evaluation	Internal lab examination at the end of year/semester.
			05	Internal evaluation	05 marks will be allotted for any creativity/ innovation/ additional learning in lab beyond prescribed set of experiments etc.
3	Mini Project	50	External evaluation		This End Examination in mini project will be for a maximum of 50 marks.
		25	Internal evaluation		Day-to-day performance in executing mini project.
4	Comprehensive Viva-Voce(CV)	50	External evaluation		This end viva voce examinations in all the subjects for 50 marks.
5	Project work	50	Internal evaluation		project work for 50 marks
		100	External evaluation		This end viva voce in project work for 100 marks
6	Skill Development Courses/Value Added Course/ Mock interviews and Group Discussion/ Mandatory Learning Courses	30	Internal evaluation		These 30 marks are awarded to the students based on the performance of two Internal examinations with a weight age of 0.75 for better score and 0.25 for the other score.
		70	Internal Evaluation		Based on the performance in the end examination.
7	Internship/Internal Project/Study Report/Work shop	00	-----		Certificate form Internship Agency
8	Mandatory Learning Courses	70	Internal evaluation		End Examination in theory subjects will be for 70 marks.
		20	Internal evaluation		These 30 marks are awarded to the students based on the performance in two (per semester) Internal examinations with a weightage of 0.75 for better score and 0.25 for the other score.
		10	Assignments/Field work/Group task/Online Test (Objective Type) (Internal evaluation)		Average of two assignments /Field work/group task in a semester each evaluated for 10 marks.
9	EAA	00	Internal evaluation		Based on performance and committee report.
10	Mandatory Learning Courses	00	Internal evaluation		No examinations. Attendance minimum is required.
11	Technical Seminar	25	Internal Evaluation		Based on Seminar Report, performance and committee report.
		50	Extern Evaluation		Based on the Performance before the External Committee

6.0 Attendance Requirements:

6.1. The student shall be eligible to appear for End examinations of the semester if he acquires a minimum of 75% of attendance in aggregate of all the subjects of that semester.

6.2. Condonation of shortage of attendance in aggregate up to 10% (65% and above and semester may be granted by the College Academic Committee.

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6.3. The student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester. They may seek re-admission for that semester when offered next.

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

6.5. Students whose shortage of attendance is not condoned in any semester are not eligible to take their End Examination of that class and their registration shall stand cancelled.

6.6. The stipulated fee shall be payable towards Condonation of shortage of attendance to the college.

6.7. A student is eligible to write the University examinations if he acquires a minimum of 50% in each subject and 75% of attendance in aggregate of all the subjects after Condonation. In case of the student having less than 50% of attendance in any one of the courses (**One subject / lab only**) during that particular semester, he/she will not be permitted to register and appear for that particular course in that particular semester end examinations. In such cases, the students need to register for makeup classes which will be notified by the CoE office after the completion of that particular semester or at appropriate time whichever is applicable. The students need to secure **90%** of the attendance in the make-up classes to appear for the supplementary examinations thereafter and this will be treated as a second attempt. The number of makeup classes to be conducted will be at least 35% of the regular class work taken in that particular course. **If the attendance is less than 50% in more than one subject/lab he/she will be completely detained in that semester**.

7.0 Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item No.6.0.

7.1. The student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical or design or CV or drawing subject or Skill Development Courses or project if he secures not less than 35% of marks in the End Examination (If applicable)) and he has to score minimum of 40% marks from internal and external exam marks put together to clear the subject.

7.2. The student shall be promoted from II to III year only if he fulfils the academic requirement of securing a minimum of 50% (41 credits out of 82) credits from all the exams conducted up to and including II year II semester regular examinations irrespective of whether the candidate takes the examination or not.

7.3. The student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing minimum of 50% (62.5 credits out of 125) credits from all the exams conducted up to and including III year II semester regular examinations, whether the candidate takes the examinations or not.

Table 5: Promotion rules

Promotion from	Total credits to register	Minimum credits to obtain for promotion
II yr to III yr	82	41
III yr to IV yr	125	62.5

7.4. The student shall register and put up minimum attendance in all 160 credits and earn 160 credits. Grades obtained in 160 credits shall be considered for the calculation of CGPA.

7.5. Students who fail to earn 160 credits as indicated in the course structure in Table-1 within eight academic years from the year of their admission shall forfeit their seat in B.Tech. Course and their admission shall stand cancelled.

8.0 Course pattern:

8.1. The entire course of study is of four academic years. Each academic year consists of two semesters

8.2. The student is eligible to appear for the End Examination in a subject, but absent at it or has failed in the End Examination may appear for that subject at the supplementary examination.

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Table: 6: Course pattern

Year	Semester	No. of Subjects		Number of Labs		Total credits	
First		CSE/CSE(DS) and CSE &BS/EEE	ECE/CE/Mech.	CSE/CSE(DS) and CSE &BS/EEE	ECE/CE/Mech.		
	First	1.BSC1 –LA&AC 2.BSC2-Applied Physics 3.ESC1-PSP (C programming) 4.ESC2-BEE/BEE/BEE/FED 5.ESC3-ED	1.BSC1 –LA &DE/LA&AC/LA&AC 2.BSC2-MEC/AC/AC 3.ESC1-PSP (C programming) 4. ESC2-FEE/EM /ED 5.HSS-English	1.ESC Lab-E&ITW 2. BSC Lab (Engg. Physics) 3.ESC Lab(PSP)	1.HSC Lab-(DE Language) 2.BSC Lab(EC lab) 3.ESC Lab-(PSP)	Subjects-5X3=15 Labs-3X1.5=4.5	19.5
	Second	1.BSC1 –DE&VC 2.BSC2-MEC 3.ESC1-DS 4. ESC2-MFCS/MFCS/MFCS/BEE 5.HSS- English 6. Mandatory Learning course (ML)-ES	1.BSC1-AC&TT/DE&VC 2.BSC2-AP/EP/EP 3.ESC1-DS 4.ESC2-NWA/BEEE/MS 5.ESC3-ED/ED/BEM 6.Mandatory Learning course(ML)-ES	1.HSC Lab(DE Language) 2.BSC Lab-(EC) 3.ESC Lab-(DS)	1.ESC Lab-E&ITW 2. BSC Lab (Engg. Physics) 3.ESC Lab(DS)	5X3=15 3X1.5=4.5 MLX0=00	19.5
Second	First	1.BSC 2.PCC 3. PCC 4. PCC 5. PCC 6.PCC Lab 7. PCC Lab 8. PCC Lab 9.Skill oriented course 10. Mandatory Learning course (ML)	1.BSC 2.PCC 3. PCC 4. PCC 5. PCC 6.PCC Lab 7. PCC Lab 8. PCC Lab 9.Skill oriented course 10. Mandatory Learning course (ML)	Subjects Labs SDC/VAC EAA		5X3=15 3x1.5=4.5 1x2.0=2.0 NC	21.5
	Second	1.ESC 2.BSC/PCC 3. PCC 4.PCC 5. HSS 6.ESC/PCC (Interdisciplinary) Lab 7.PCC Lab 8. PCC Lab 9.Skill oriented course	1.ESC 2.BSC/PCC 3. PCC 4.PCC 5. HSS 6.ESC/PCC (Interdisciplinary) Lab 7. 6.PCC Lab 8. PCC Lab 9.Skill oriented course	Subjects Labs SDC/VAC EAA Mandatory Learning Course-1/2/3 (ECE/CSE&EEE/CE&ME) (Indian Heritage, Culture Tradition)Mandatory Learning Course-3 (Constitution of India)		5X3=15 3X1.5=4.5 1x2.0=2.0 NC NC	21.5
Third	First	1.PCC 2.PCC 3. PCC 4.OEC/JOE 5. PEC 6. PCC Lab 7. PCC Lab 8 Skill Advanced Course/Soft Skill Course. 9. Mandatory Learning course (ML) 10.summer Internship(2 Months) after second year to be evaluated during 5th semester (Mandatory)	1.PCC 2.PCC 3.PCC 4.OEC/JOE 5. PEC 6. PCC Lab 7. PCC Lab 8 Skill Advanced Course/Soft Skill Course. 9. Mandatory Learning course (ML) 10.summer Internship(2 Months) after second year to be evaluated during 5th semester (Mandatory)	Subjects OEC/JOE Labs SDC/VAC Mandatory Learning Course-1/2/3 (ECE/CSE&EEE/CE&ME) (Indian Heritage, Culture Tradition) Summer Internship		4X3=12 1X3=3.0 2X1.5=3.0 1x2=2.0 NC 1X1.5=1.5	21.5
	Second	1.PCC 2.PCC 3. PCC 4.OEC/JOE 5. PEC 6. PCC Lab 7. PCC Lab 8. PCC Lab 8 Skill Advanced Course/Soft Skill Course. 9. Mandatory Learning course (ML)	1.PCC 2.PCC 3. PCC 4.OEC/JOE 5. PEC 6. PCC Lab 7. PCC Lab 8. PCC Lab 8 Skill Advanced Course/Soft Skill Course. 9. Mandatory Learning course (ML)	Subjects OEC/JOE Labs SDC/VAC Mandatory Learning Course-1/2/3 (ECE/CSE&EEE/CE&ME) (Indian Heritage, Culture Tradition)Mandatory Learning Course-3 (Constitution of India)		4X3=12 1X3=3.0 3x1.5=4.5 1X2.0=2.0 NC	21.5
Fourth	First	1.PEC 2.PEC 3. PEC 4.OEC/JOE 5. OEC/JOE 6. Skill Advanced Course/Soft Skill Course. 7. HSSE	1.PEC 2.PEC 3. PEC 4.OEC/JOE 5. OEC/JOE 6. Skill Advanced Course/Soft Skill Course. 7. HSSE	Subjects OEC/JOE SDC/VAC HSSE Comprehensive Viva Industrial/Research Internship 2 Months(Mandatory) after third year evaluated during VII semester Comprehensive Viva Voce		3X3=09 2X3=06 1X2=02 1X2=02 1X1=01 1X2=02 1X1-01	23
	Second	Technical Seminar Internship in Industry Major Project	Technical Seminar Internship in Industry Major Project			1X01=01 1X05=05 1X06=06	12
TOTAL CREDITS							160

9.0 Transitory Regulations:

Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone this course in earlier regulations or have discontin[illegible] continue the course are eligible for admission into the unfinished semester from the date o[illegible]

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of class work with the same or equivalent subjects as and when subjects are offered subject to section 2.0 and they continue to be in the academic regulations in which they were readmitted.

10.0 With-holding of results:

If the candidate has any dues not paid to the Institute or if any case of indiscipline of malpractice is pending against him, the result of the candidate shall be withheld and he will not be allowed / promoted into the next higher semester. The issue of degree is liable to be withheld in such cases.

11.0 Award of Class:

After the student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. degree he shall be placed in one of the following four classes:

Table 7: Award of Division

Class Awarded	% of marks to be secured	Division/ Class	CGPA	
First Class with Distinction	70% and above	First class With Distinction	≥ 7.5	CGPA secured from 160 Credits
First Class	Below 70% but not less than 60%	First Class	≥ 6.5 and < 7.5	
Second Class	Below 60% but not less than 50%	Second Class	≥ 5.5 and < 6.5	
Pass Class	Below 50% but not less than 40%	Pass	≥ 4 and < 5.5	

12.0 Grading:

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student falls.

Table 8: Conversion into Grades and Grade points assigned

Range in which the % of marks in the subject fall	Grade	Grade point Assigned	Performance
90 to 100	O	10	Outstanding
80 to 89.9	A^+	09	Excellent
70 to 79.9	A	08	Very Good
60 to 69.9	B^+	07	Good
50 to 59.9	B	06	Above Average
45 to 49.9	C	05	Average
40 to 44.9	P	04	Pass
<40	F	00	Fail
AB	AB	00	Fail

12.1. Requirement for clearing any subject: The students have to obtain a minimum of 35% in End Examination and they have to score minimum of 40% marks from Internal and external exam marks put together to clear the subject. Otherwise they will be awarded fail grade.

12.2. F is considered as a fail grade indicating that the student has to reappear for the end supplementary examination in that subject and obtain a non-fail grade for clearing that subject.

12.3. In case of skill development/ value added course / soft skill subjects, as there is no end exam, all 100 marks are for internal assessment only. Student has to score 40% in these courses to complete the subject which will be evaluated internally. Marks obtained in these courses shall not be considered for award of Division.

12.4. To become eligible for the award of degree the student must obtain a minimum CGPA of 4.0

13.0 Supplementary Examinations:

Apart from the regular End Examinations, the institute may also schedule and conduct supplementary examinations for all subjects for the benefit of students with backlogs. Such students writing supplementary examinations as supplementary candidates may have to write more than one examinat

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eighth semester, special (Advance) supplementary examinations will be conducted in second week following the results publication date of regular examination of eighth semester only.

14.0 Grade Point Average (GPA) and Cumulative Grade Point Average(CGPA)

The Grade Point Average (GPA) for each semester and Cumulative Grade Point Average (CGPA) up to any semester is calculated as follows:

i) Semester Grade Point Average will be computed as follows:

$$GPA = \frac{\sum_1^n C_j \times GP_j}{\sum_1^n C_j}$$

Where, n is the number of subjects in that semester. C_j is Credits for the subjects. GP_j is the grade point obtained for the subject and the summation is over all the subjects in that semester.

ii) A Cumulative Grade Point Average (CGPA) will be computed for every student at the end of each semester. The CGPA would give the cumulative performance of the student from the first semester up to the end of the semester to which it refers to and is calculated as follows:

$$CGPA = \frac{\sum_1^m GPA_j \times TC_j}{\sum_1^m TC_j}$$

Where 'm' is the number of semester under consideration. TC_j the total number of credits for a j^{th} semester and GPA_j is the Grade Point Average of the j^{th} semester. Both GPA and CGPA will be rounded off to the second digit after decimal and recorded as such.

While computing the GPA / CGPA, the subjects in which the student is awarded zero grade points will also be included.

For any academic/employment purpose the following formulae shall be used for conversion of CGPA to % of marks. % of marks = (CGPA –0.5) x 10.

15.0 Grade Sheet:

A grade sheet (Memorandum) will be issued to each student indicating his performance in all subjects of that semester in the form of grades and also indicating the GPA and CGPA.

16.0 Award of Degree

After having admitted into the program, B.Tech degree shall be conferred on a student who has satisfied the following conditions.

i) The student joining with Intermediate qualification must have, after admission into the Regular B.Tech programme of the college, pursued a regular course of study for not less than four academic years and not more than eight academic years.

ii) The student joining under lateral entry scheme with diploma qualification must have, after admission into III Semester B.Tech, pursued a regular course of study for not less than three academic years and not more than six academic years.

iii) The student must have satisfied the minimum academic requirements in appropriate branch of engineering in each semester of the program, herein after prescribed.

iv) Students must register for all the courses and earn the credits specified

v) Students who fail to fulfil all the academic requirements for the award of degree within the specified period from the year of their admission shall forfeit their seat in B.Tech course and their admission stands cancelled.

vi) The student shall successfully complete non-credit courses like EAA/MC/Internship.

vii) The student has no dues to the institution, library, hostels etc.

viii) The student has no disciplinary action pending against him/her.

The Degree will be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu on recommendations by the Academic council of RGMCET (Autonomous) basing on the eligibility as in clause 6.0 and 7.0.

17.0 Transcripts:

After successful completion of prerequisite credits for the award of degree, a Trans
performance of all academic years will be issued as a final record. Duplicate transcripts w
if required after the payment of requisite fee and also as per norms in vogue.

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18.0 Rules of Discipline:

18.1. Any attempt by any student to influence the teachers, Examiners, faculty and staff of Examination section for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice cases and the student can be debarred from the college.

18.2. When the student absents himself, he is treated as to have appeared and obtained zero marks in that subject(s) and grading is done accordingly.

18.3. When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, he is awarded zero marks in that subject(s).

18.4. When the student's answer book is confiscated for any kind of attempted or suspected malpractice, the decision of the Chief Superintendent is final.

19.0 Minimum Instruction Days:

The minimum instruction days for each semester shall be 95 clear instruction days excluding the days allotted for tests/examinations and preparation holidays declared if any.

20.0 Amendment of Regulations:

The college may, from time to time, revise, amend or change the regulations, scheme of examinations and syllabi. However the academic regulations of any student will be same throughout the course of study in which the student has been admitted. However students will continue to be in the academic regulations in which they were readmitted.

21.0 Transfers

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

22.0 General:

22.1. The Academic Regulations should be read as a whole for the purpose of any interpretation.

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

22.3. The Institute 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 Institute.

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

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Academic Regulations for B.Tech.
(Lateral Entry Scheme)

(Effective for the students getting admitted into II year from the Academic Year 2021-2022 onwards)

1.0 The Students have to acquire a minimum of 121 credits out of 121 from II to IV year of B.Tech. Program (Regular) for the award of the degree.

2.0 Students, who fail to fulfil the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.

3.0 The same attendance regulations are to be adopted as that of B. Tech. (Regular).

4.0 Promotion Rule:

The student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing minimum of 43 credits out of 86 credits from all the exams conducted up to and including III year II semester regular examinations, whether the candidate takes the examinations or not.

5.0 Award of Class:

After the student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree he shall be placed in one of the following four classes: The marks obtained in the best 121 credits will be considered for the calculation of percentage and award of class.

Table 1: Award of Division

Class Awarded	**% of marks to be secured**	Division/ Class	CGPA	
First Class with Distinction	70% and above	First class With Distinction	≥ 7.5	CGPA secured from 121 Credits
First Class	Below 70% but not less than 60%	First Class	$6.5 and < 7.5$	
Second Class	Below 60% but not less than 50%	Second Class	$\geq 5.5 \; and \; < 6.5$	
Pass Class	Below 50% but not less than 40%	Pass	$\geq 4 \; and \; < 5.5$	

6.0 All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

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R G M COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

I B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
			Theory	Tutorial	Lab		Internal	External	Total
THEORY									
A0001201	BSC	Linear Algebra and Advanced Calculus	2	1	0	3	30	70	100
A0002201	BSC	Applied Chemistry	2	1	0	3	30	70	100
A0501201	ESC	Problem Solving and Programming	2	1	0	3	30	70	100
A0301201	ESC	Engineering Drawing	1	0	4	3	30	70	100
A0003201	HSC	English for Engineers	2	1	0	3	30	70	100
PRACTICALS									
A0091201	HSC	Digital English Language Lab	0	0	3	1.5	25	50	75
A0092201	BSC	Engineering Chemistry Lab	0	0	3	1.5	25	50	75
A0591201	ESC	Problem Solving and Programming Lab	0	0	3	1.5	25	50	75
		Total	**9**	**4**	**13**	**19.5**	**225**	**500**	**725**

I B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
			Theory	Tutorial	Lab		Internal	External	Total
THEORY									
A0007202	BSC	Differential Equations and Vector Calculus	2	1	0	3	30	70	100
A0009202	BSC	Engineering Physics	2	1	0	3	30	70	100
A0502202	ESC	Data Structures	2	1	0	3	30	70	100
A0303202	ESC	Material Science	2	1	0	3	30	70	100
A0304202	ESC	Basic Engineering Mechanics	2	1	0	3	30	70	100
A0010202	MLC	Environmental Studies	2	0	0	0	30	70	100
PRACTICALS									
A0592201	ESC	Engineering Workshop & IT Workshop	0	0	3	1.5	25	50	75
A0093201	BSC	Engineering Physics lab	0	0	3	1.5	25	50	75
A0593202	ESC	Data Structures Lab	0	0	3	1.5	25	50	75
		Total	**12**	**5**	**9**	**19.5**	**225**	**570**	**825**

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DEPARTMENT OF MECHANICAL ENGINEERING

II B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
			Theory	Tutorial	Lab		Internal	External	Total
THEORY									
	BSC	Numerical Methods & Probability Theory	2	1	0	3	30	70	100
	PCC	Engineering Thermodynamics	2	1	0	3	30	70	100
	PCC	Mechanics of Solids	2	1	0	3	30	70	100
	PCC	Manufacturing Process	2	1	0	3	30	70	100
	PCC	Fluid Mechanics & Hydraulic Machinery	2	1	0	3	30	70	100
PRACTICALS									
	PCCL	Materials Science & Mechanics of Solids Lab	0	0	3	1.5	25	50	75
	PCCL	Manufacturing Process Lab	0	0	3	1.5	25	50	75
	PCCL	Fluid Mechanics & Hydraulic Machinery Lab	0	0	3	1.5	25	50	75
SKILL DEVELOPMENT COURSE & MLC									
	SDC	Design Thinking	2	1	0	2	30	70	100
	MLC	Constitution of India	2	1	0	0	-	-	-
		Total	**14**	**7**	**09**	**21.5**	**255**	**570**	**825**

II B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
			Theory	Tutorial	Lab		Internal	External	Total
THEORY									
	ESC	Basic Electrical & Electronics Engg.	2	1	0	3	30	70	100
	ESC/PCC	Python Programming	2	1	0	3	30	70	100
	PCC	Kinematics of Machinery	2	1	0	3	30	70	100
	PCC	Applied Thermodynamics	2	1	0	3	30	70	100
	HSS	Industrial Management & Accountancy	2	1	0	3	30	70	100
PRACTICALS									
	ESCL	Basic Electrical & Electronics Engg. Lab	0	0	3	1.5	25	50	75
	ESC/PCCL	Python Programming Lab	0	0	3	1.5	25	50	75
	PCCL	Thermal Engineering Lab	0	0	3	1.5	25	50	75
SKILL DEVELOPMENT COURSE & MLC									
	SDC	Aptitude Arithmetic Reasoning & Comprehension	2	1	0	2	30	70	100
		Total	**12**	**6**	**9**	**21.5**	**255**	**570**	**825**

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DEPARTMENT OF MECHANICAL ENGINEERING

I B.Tech, I-Sem(ME)

L	T	C
2	1	3

(A0001201) LINEAR ALGEBRA AND ADVANCED CALCULUS

For Branches: CE, EEE, ME, CSE, CSE (DS), CSE&BS

COURSE OBJECTIVES:

- To familiarize the concepts of matrices and mean value theorems and their applications in engineering.
- To equip the students to solve various application problems in engineering through evaluation of Gamma, Beta functions and multiple integrals etc.,

COURSE OUTCOMES:

After completion of the course the student will be able to:

- Understand the use of matrices and linear system of equations in solving Network analysis, encoding and decoding in Cryptography and Quantum mechanics problems.
- Apply the concept of Gamma and Beta functions in digital signal processing, discrete Fourier transform, digital filters and Oscillatory theory in engineering.
- Analyze differential and integral calculus to solve improper integrals and its applications in many engineering disciplines.
- Determine the process to evaluate double and triple integrals and understand its usage to find surface area and volumes of various bodies in engineering.
- Identify the applications of advanced calculus & Linear algebra in electro-magnetic theory and in telecommunication engineering.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	-	-	-	-	-	-	-
CO2	3	2	2	2	3	-	-	-	-	-	-	-
CO3	2	2	2	2	3	-	-	-	-	-	-	-
CO4	3	2	3	3	2	-	-	-	-	-	-	-
CO5	2	3	2	2	2	-	-	-	-	-	-	-

UNIT – I

Matrices: Elementary row transformations – Rank – Echelon form, Normal form – Solutions of Linear System of Homogenous and Non Homogeneous equations.

UNIT – II

Eigen Values, Eigen vectors – Properties – Cayley – Hamilton Theorem – Inverse and Power of a matrix by Cayley – Hamilton theorem.

UNIT – III

Quadratic forms: Linear Transformation – Reduction of quadratic form to canonical form and their nature (Rank, Signature and Index).

UNIT – IV

Mean value theorems: Rolle's Theorem – Lagrange's Mean Value Theorem – (excluding proof). Simple examples of Taylor's and Maclaurin's Series.

Functions of several variables – Jacobian – Maxima and Minima of functions of two variables - Lagrange method of Multipliers with three variables only.

UNIT – V

Multiple integrals: – Evaluation of Double integrals (Cartesian and Polar) – Change of Variables – Change of order of Integration – Changing into Polar coordinates – Evaluation of triple integrals.

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UNIT – VI

Special functions: Gamma function – Properties – Beta function – properties – Relation between Gamma and Beta functions – Evaluation of Integrals using Gamma & Beta functions.

TEXTBOOKS:

1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publications.
2) R. K. Jain, S. R .K. Iyengar, Advanced Engineering Mathematics, Alpha Science.
3) T.K.V. Iyengar, B. Krishna Gandhi, A Text Book of Engineering Mathematics, Vol – I, S. Chand & Company.

REFERENCES:

1) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2) Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons,2011.
3) Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

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DEPARTMENT OF MECHANICAL ENGINEERING

I B.Tech, I-Sem(ME)

T	L	C
2	1	3

(A0002201) APPLIED CHEMISTRY

For branches: CE & ME

COURSE OBJECTIVES:

- To impart the concept of soft and hard waters, softening methods of hard water.
- To train the students on the concepts and applications of electrochemistry.
- To provide an understanding of the corrosion principles and engineering methods used to minimize and prevent the corrosion.
- To learn about the properties of refractory materials.
- The course provides an introduction to polymer chemistry based on synthesis mechanisms associated with chain-growth and step-growth.
- To acquire knowledge about types of fuels, liquid and gaseous fuels.

COURSE OUTCOMES:

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

- Identify and apply suitable water softening techniques (L1)
- Apply the principles of some electrochemical techniques and electrodes (L3)
- Demonstrate the corrosion prevention methods and factors affecting corrosion (L2)
- Explain the preparation, properties, thermoplastics & elastomers (L2)
- Explain the preparation, setting and hardening of cement (L2)
- Explain calorific value, octane number, refining of petroleum (L2)

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	1	-	1	1	-	1	-	-	-	-	-
CO2	1	-	-	2	-	-	1	1	-	-	-	-
CO3	1	1	-	-	1	-	-	-	-	-	-	-
CO4	1	-	-	-	-	1	-	1	-	1	-	-
CO5	1	-	1	-	1	-	-	1	-	-	-	1
Course	1	1	-	1	-	1	1	-	-	-	1	-

UNIT 1: Water Technology

Introduction – Soft Water and hard water, hardness of water-Estimation of hardness of water by EDTA Method and Numerical problems on hardness – Water Softening methods (zeolite and ion-exchange processes)–Boiler troubles (Priming and foaming, scale and sludge, Boiler Corrosion, Caustic Embrittlement).

UNIT 2: Electrochemistry and Applications:

Introduction– Conductance, Specific conductance, Equivalent Conductance and molar conductance – Determination of equivalent conductance by Wheatstone bridge method – Conductometric titrations (acid-base titrations) –Numerical Problems on conductance –Electrodes –Reference electrode (Standard hydrogen electrode) – Daniel Cell.

UNIT 3: Corrosion:

Definition –Theories of Corrosion (Direct chemical attack type of corrosion, electrochemical type of corrosion and their mechanisms) – Typesof corrosion: (galvanic & pitting) – Factors affecting the rate of the corrosion –proper design and material selection –Cathodic protection.

UNIT-4 Advanced Engineering Materials

Refractories- Classification, Properties and its Applications, Reasons for failure of the refractory materials.

Cement: Introduction, classification, Types of cement, Composition of cement, Preparation of Portland cement, setting and hardening of the cement.

UNIT 5: Polymer Technology

Classification of polymers – Functionality – Chain growth, step growth polymerization and Copolymerization with specific examples – Mechanisms of additional polymerization

Plastics**:** Preparation, properties and applications of PVC, Teflon and Bakelite.

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Elastomers: Buna-S and Buna-N preparation, properties and applications.

UNIT 6: Chemistry of Fuels:

Introduction –Types of fuels – Calorific value – Numerical problems based on calorific value.
Solid Fuels: Analysis of coal – Proximate and Ultimate analysis.
Liquid Fuels: Extraction of petroleum, knocking, Octane and Cetane number.
Gaseous Fuels: Producer gas, water gas and biogas.

TEXT BOOKS:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

REFERENCE BOOKS:

1. K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, Engineering Chemistry 1/e Mc Graw Hill Education (India) Pvt Ltd, New Delhi 2016
2. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman,1992.
3. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.

R G M COLLEGE OF ENGINEERING AND TECHNOLOGY

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DEPARTMENT OF MECHANICAL ENGINEERING

I B.Tech, I-Sem(ME)

L	T	C
2	1	3

(A0501201) PROBLEM SOLVING AND PROGRAMMING

For Branches CE, EEE, ME, ECE, CSE, CSE(DS), CSE&BS

COURSE OBJECTIVES:

- Introduce the internal parts of a computer, and peripherals.
- Introduce the Concept of Algorithm and use it to solve computational problems
- Identify the computational and non-computational problems
- Teach the syntax and semantics of a C Programming language
- Demonstrate the use of Control structures of C Programming language
- Illustrate the methodology for solving Computational problems

COURSE OUTCOMES:

- Construct his own computer using parts (L6).
- Recognize the importance of programming language independent constructs (L2)
- Solve computational problems (L3)
- Select the features of C language appropriate for solving a problem (L4)
- Design computer programs for real world problems (L6)
- Organize the data which is more appropriated for solving a problem (L6)

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	2	-	-	-	2	1	-	-
CO2	2	-	-	-	2	-	-	-	-	-	-	-
CO3	3	2	3	2	-	2	-	-	2	-	-	-
CO4	3	-	2	-	-	-	-	-	3	-	-	-
CO5	-	3	3	-	-	2	-	-	-	-	2	-
CO6	-	-	3	-	-	-	2	-	-	-	-	-

UNIT I

Computer Fundamentals: What is a Computer, Evolution of Computers, Generations of Computers, Classification of Computers, Anatomy of a Computer, Memory revisited, Introduction to Operating systems, Operational overview of a CPU.

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Loader, Linker, Program execution, Fourth generation languages, Fifth generation languages, Classification of Programming languages, Structured programming concept, Algorithms, Pseudo-code, Flowcharts, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.

Learning Outcomes: Student should be able to

1. Identify the different peripherals, ports and connecting cables in a PC (L2)
2. Illustrate the working of a Computer (L3)
3. Select the components of a Computer in the market and assemble a computer (L4)
4. Solve complex problems using language independent notations (L3)

UNIT II

Introduction to computer problem solving: Introduction, the problem-solving aspect, top-down design, implementation of algorithms, the efficiency of algorithms, the analysis of algorithms.

Fundamental algorithms: Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer.

Learning Outcomes: Student should be able to

1. Solve Computational problems (L3)
2. Apply Algorithmic approach to solving problems (L3)
3. Analyze the algorithms (L4)

UNIT III

C Language Preliminaries: Keywords and Identifiers, Constants, Variables, Data T
Output Statements with suitable illustrative "C" Programs.

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Operators: Assignment Operators, Relational and Logical Operators, Increment and Decrement Operators, Bitwise Operators, Ternary Operator, Type Conversion, Precedence and Associativity with suitable illustrative C Programs.

Learning Outcomes: Student should be able to

1. Understand keywords, data types in C (L2)
2. Use various operators in C program (L6)
3. Apply type conversions and also understand, analyse precedence and associativity (L2)

UNIT IV

Conditional/Decision Statements: if, if-else, Nested if-else, else-if ladder, Switch-Statement and goto statement with suitable illustrative C Programs.

Loop Control Statements: while, do-while and for with suitable illustrative "C" Programs, break, continue statements.

Learning Outcomes: Student should be able to

1. Select the control structures for solving the problem (L4)
2. Apply statements for solving the problem (L3)
3. Understand the statements in C language (L2)

UNIT V

Arrays: Definition, Importance of an array in C language, One-Dimensional Arrays, Two-Dimensional Arrays, Example programs on the topics mentioned above

Strings: Introduction to Strings, String I/O, String Operations and functions.

Functions: Introduction to Functions, benefits of functions, types of functions, Function calls, return vs. exit( ), Parameter Passing mechanisms, Call-by-Value, Recursion.

Learning Outcomes: Student should be able to

1. Design and develop C programs using functions and arrays. (L6)
2. Apply modular approach for solving the problem (L3)
3. Understand and apply various string handling functions (L2)

UNIT VI

Files : Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions(standard library input / output functions for files), file status functions (error handling),Positioning functions, command –line arguments, C program examples.

Storage Classes, pre-processor directives.

Learning Outcomes: Student should be able to

1. Describe the Files types and File operations. (L2)
2. Practice Command line arguments. (L3)
3. Perform Error handling in Filerelated programming in C.(L4)

TEXT BOOKS:

1. PradipDey, and Manas Ghosh, "Programming in C", 2018, Oxford University Press.
2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.
3. Brian W. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson.

REFERENCE BOOKS:

1) P.Chenna Reddy, " Computer Fundamentals and C Programming" 2018, BS Publications
2) RS Bichkar" Programming with C", 2012, Universities Press.
3) PelinAksoy, and Laura Denardis, "Information Technology in Theory", 2017, Cengage Learning.

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DEPARTMENT OF MECHANICAL ENGINEERING

I B.Tech, I-Sem(ME)

T	P	C
1	4	3

(A0301201) ENGINEERING DRAWING

For Branches: CE, EEE, ME, ECE, CSE, CSE(DS), CSE&BS

COURSE OBJECTIVES:

- Understand and appreciate the importance of basic concepts and principles of Engineering Drawing
- Realize and appreciate the importance of engineering drawing as a medium of communication to covey ideas in engineering field
- Enable the students to be aquatint with various basic engineering drawing formats
- Learn to take data and transform in to graphic drawings.

COURSE OUTCOMES:

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

- Understand the conventions and the methods adopted in engineering drawing.
- Understand the concepts of orthographic projection.
- Improve their visualization skills and to apply these skill in developing new products
- Improve technical communicative skills in the form of communicative drawings

MAPPING WITH COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3	-	-	2	2	3	2	-	3	2	3	2
CO2	3	2	3	2	3	-	-	2	2	3	-	-	3	2	2	2
CO3	3	2	2	1	3	-	-	2	2	3	-	1	1	2	2	2
CO4	3	2	2	2	3	-	-	2	2	3	1	-	1	2	3	2

UNIT I

Geometrical Constructions: Polygons-Construction of Regular Polygons using given length of a side; Conic sections- Ellipse- Arcs of Circles and Oblong Methods, Construction of Parabola and Hyperbola by eccentricity method only.

UNIT II

Projection of Points and Lines: Introduction to Orthographic Projections- Projections of Points-Projections of Straight Lines parallel to both planes; Projections of Straight Lines-Parallel to one and inclined to other plane, inclined to both planes, determination of true lengths, angle of inclinations.

UNIT III

Projections of Planes: Regular Planes, Plane Perpendicular to one plane and Parallel to another Reference plane, Plane inclined to one Reference Plane.

UNIT IV

Projections of Solids: Prisms, Pyramids, Cones and Cylinders with the axis perpendicular to one plane and parallel to the reference plane, Plane inclined to one reference Plane only.

UNIT V

Section of solids: Sectioning of prism, pyramid, cone and cylinder– sectional view – true shape. Solids in simple position and cutting plane inclined to one reference plane only.

Development of surface of solids: Development of truncated prism, pyramid, cone and cylinder – frustum of cone and pyramid.

UNIT VI

Orthographic and Isometric Projections: Introduction to Isometric projections/ views, Construction of Isometric view/ projections of simple solids. Conversion of Isometric Views to Orthographic Views/Projections-Conversion of Orthographic Views to Isometric Projection/ Views.

TEXT BOOK:

1) Engineering Drawing. K.L Narayana, P. Kannaiah, Scitech Publications, 2011
2) Engineering Drawing by N.D. Bhatt, Chariot Publications,2014

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REFERENCE BOOKS:

1) Engineering Drawing, B.V.R Gupta, J.K. Publishers,2008
2) Engineering Drawing and Graphics, Venugopal /New age publications,2007
3) Engineering Drawing by M.B. Shah and B.C. Rana, Pearson Publishers,2009
4) Engineering Drawing, Johle, Tata Mc Graw – Hill, 2008
5) K.V. Natarajan, 'A text book of Engineering Graphics', Dhanalakshmi publishers, Chennai, 2006.

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R G M COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

I B.Tech, I-Sem(ME)

T	L	C
2	1	3

(A0003201) ENGLISH FOR ENGINEERS

For Branches: CE, EEE, ME, ECE, CSE, CSE(DS), CSE&BS

COURSE OBJECTIVES

- English for Engineers is prescribed to make students communicate their thoughts, opinions and ideas freely in real life situations.
- To improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- To equip students with professional skills & soft skills
- Develop Communication skills in formal and informal situations.

COURSE OUTCOMES

- Students will be able to use creativity in writing such as E-mails, Reports, Resume writing and Info- Graphics to enhance engineering abilities
- Students will analyze the concepts of critical and analytical Reading skills to understand needs of engineering in society by using modern tools
- Students will be able to develop flair for any kind of writing with rich vocabulary to enhance communicative skills
- Students will understand the basic Grammar techniques and utilize it for language development
- Students will apply the strategies of Soft skills & Ethical components

MAPPING OF COS & POS:

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

UNIT- I

a) Reading: Skimming the text for theme
Reading Text: Engineering in Society by Sarah Bell
b) Grammar: Types of Sentences - Demonstratives- Articles- Prepositions
c) Writing: Paragraph Writing & Practice
d) Vocabulary: Root words - Word lists from Word power Made Easy by Norman Lewis
Method of Teaching: Analyzing the theme of Reading Prescribed Text, Worksheets on Articles & Prepositions, Assignment on Short paragraphs, Vocabulary activities through worksheets.

UNIT- II

a) Reading: Scanning the text for specific details
Reading Text: Sultana's Dream by Begum Rokeya
b) Grammar: Tenses & Usage
c) Writing: Formal Letters and E-mail writing – Tips & Practice
d) Vocabulary: Homonyms - Word lists & Practice
Method of Teaching: Classroom discussion &critical appreciation of the Reading Lesson, Worksheets on Tenses, Practice of Formal Letters, Vocabulary Quizzes- Assignment.

UNIT- III

a) Reading: Note-making (identifying the main ideas and making notes)
Reading text: Satya Nadella: When Empathy is Good for Business
https://www.morningfuture.com
b) Grammar: Framing questions –Wh Qs - Yes/No questions - Question Tags
c) Writing: Resume & Cover letter Writing- Tips &Practice
d) Vocabulary: Synonyms & Antonyms
Method of teaching: Class room Discussions, Student Activity on Questions,E-mail writing, Vocabulary activities through games- Practice- Assignment.

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UNIT – IV

a) Reading: Summarizing
Reading Text: Life is a Pizza by Richard Templar from Rules of Life
b) Grammar: If Clauses – Usage & Practice
c) Writing: Writing Definitions – Process of Writing - Tips & Practice
d) Vocabulary: Idioms & Phrases- Practice
Method of Teaching: Discussion & Assignment, If Clauses from Newspapers, Preparing profiles for Resume, Vocabulary activities through worksheets

UNIT – V

a) Reading: Intensive reading (reading for every detail)
Reading text: What is a Drone: Main Features & Applications of Today's Drones by Jack Brown
b) Grammar: Active Voice –Passive Voice- Usage
c) Writing: Report Writing- Types - Practice
d) Vocabulary: Technical Terms- Word Lists- Practice
Method of Teaching: Assignment on Drones, Worksheets on Active/ Passive voice**,** Watch a Documentary on social issues and draft a Report, Technical Terms- Quiz.

UNIT- VI

a) Reading: Appreciating a poem (focus on genre)
Reading text: Where the mind is without fear by Rabindranath Tagore
b) Grammar: Direct & Indirect Speech - Common Errors- Practice
c) Writing: Info-Graphics- Types- Practice
d) Vocabulary: Foreign Derived Words- Word Lists from Norman Lewis Word Power Made Easy
Method of teaching: Learner's interaction on the poem, Practicing Grammar through on line tests, practice reading and understanding graphs, Quiz & worksheets.

REFERENCE TEXTS:

1) English Language & Communication Skills for Engineers (AICTE Syllabus) by Sanjay Kumar & Pushpa Latha, Oxford University Press, 2018
2) Practical English Usage by Michael Swan, Oxford University Press.
3) Technical Communication, Principles and Practice by Meenakshi Raman & Sangeetha Sharama, Oxford University Press, 2016
4) Word Power Made Easy by Norman Lewis, Goyal Publications.
5) 4000 Essential English Words 3 by Paul Nation, Compass Publishing, 2009.
6) GRE/TOEFL Sources to teach vocabulary

ONLINE SOURCES FOR PRESCRIBED READING TEXTS:

https://www.morningfuture.com
https://www.raeng.org.uk/publications/reports/engineering-in-society
https://digital.library.upenn.edu/women/sultana/dream/dream.html,
https://www.mydronelab.com/blog/what-is-a-drone.html
https://www. Freealbaab.free.fr › The Rules of Life PDF
https://www.poetryfoundation.org ›Gitanjali 35 by Rabindranath Tagore | Poetry Foundation

ONLINE SOURCES FOR PRESCRIBED LISTENING SKILLS:

https://learnenglish.britishcouncil.org/skills/listening
https://agendaweb.org/listening/comprehension-exercises.html
https://www.123listening.com/
https://www.linguahouse.com/learning-english/skill-4-learners/listening
https://www.talkenglish.com/listening/listen.aspx
https://ed.ted.com/

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3 1.5

(A0091201) DIGITAL ENGLISH LANGUAGE LAB

For Branches: CE, EEE, ME, ECE, CSE, CSE(DS), CSE&BS

The Digital English Language Lab focuses on the production and practice of sounds of language and equips students with the use of English and vocabulary in everyday situations and contexts.

COURSE OBJECTIVES:

- To facilitate the students to use language effectively in everyday social conversations
- To expose the students to the blend of self-instructional and modes of language learning teacher assisted through digital lab
- To improve the fluency and intelligibility of student in spoken English and neutralize their mother tongue influences
- To help the students to participate in group discussions, to face interviews and shape the individual language learning

COURSE OUTCOMES:

- Social interactions, greetings, self-introductions and group talk
- Improving standard pronunciation patterns and neutralize the mother tongue impact
- Developing communication through listening, reading, speaking and writing activities
- Enhancing vocabulary and grammar to develop professional language
- Improving life skills through GD and role plays practices

MAPPING WITH COS& POS:

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

Digital English Language Lab consists of two parts:

1) CALL (Lab): Computer Assisted Language Learning
2) ICS (Lab): Interactivity Communication Skills

EXERCISE-I

a) Introduction to Phonetics - Speech Sounds - Vowels - Phonetic Transcription -CALL Lab
b) Ice Breaking Activity - Self Introductions (SWOT) –Social Interactions -Pair work - ICS Lab

EXERCISE-II

a) Diphthongs - Consonants - Phonetic Transcription - CALL Lab
b) Just A Minute (JAM) - ICS Lab

EXERCISE-III

a) Listening Comprehension (audio) - IELTS Testing Exercises -CALL Lab
b) Speaking Activity - Group talk - ICS Lab

EXERCISE-IV

a) Vocabulary Building - Synonyms & Antonyms - Analogy - Testing Exercises -CALL Lab
b) Narration of a Story/Event/ Describing an Object - ICS Lab

EXERCISE-V

a) Situational Dialogues - CALL Lab
b) Role Play - ICS Lab

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EXERCISE-VI

a) Pronunciation Evaluation Testing Exercises through EPD - CALL Lab
b) Group Discussion - ICS Lab
   - Any student based activities

COURSE OUTCOMES:

Student is able to:

- ❖ Understand the spoken skills from CALL and ICS
- ❖ Know the variations in accent of native and non-native speakers of English and achieve accent neutralization
- ❖ Develop listening comprehension skills

PRESCRIBED SOFTWARE:

K-VAN Solutions (licensed software)

1) Advance Communication Skills Lab
2) English Language Communication Skills Lab
3) Cambridge Advanced Learners' English Dictionary with CD
4) IELTS Academic Preparation and Practice with CD

BOOKS SUGGESTED FOR DELL: (CENTRAL LIBRARY)

1) Skill Pro – A Course in Communication Skills and Soft Skills by Prof. K. Sumakiran et.al, EMESCO.
2) Skill Pro-I Foundation Course - 4 - by Dr. G. Gulam Tariq et.al, Maruthi Publications.
3) Strengthen YourSteps – A Multimodal Course in Communication skills by Dr. M. Hari
4) Prasad et.al
5) English Pronouncing Dictionary Daniel Jones Current Edition with CD
6) English Dictionary for Advanced Learners, (with CD) International edn.Macmillan 2009.

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(A0092201) ENGINEERING CHEMISTRY LAB

For branches: CE, EEE, ME, ECE, CSE, CSE(DS), CSE&BS

COURSE OBJECTIVES:

- Verify the fundamental concepts with experiments

COURSE OUTCOMES:

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

- Learning the analytical skills while doing the experiments (L3)
- prepare simple and advanced polymer materials (L2)
- Measure the concentration of the solutions by conductometric titrations (L3)
- Analyse the IR and UV-Visible Spectra of some organic compounds (L3)

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	1	-	-	-	-	1	-	-	1
CO2	-	2	1	-	2	1	1	1	-	-	1	-
CO3	-	1	-	-	1	-	1	-	1	-	-	1
CO4	1	3	2	1	2	-	1	-	-	-	1	1
Course	1	2	1	-	2	1	-	-	1	1		1

LIST OF EXPERIMENTS:

1) Preparation of standard $K_2Cr_2O_7$ solution
2) Estimation of Hardness of Water by using Standard EDTA solution
3) Estimation of Copper by using Standard EDTA solution
4) Estimation of Magnesium by using Standard EDTA solution
5) Estimation of Ferrous Ion by Dichrometry.
6) Determination of Strength of given Hydrochloric Acid against standard sodium hydroxide solution by Conductometric titrations
7) Determination of Strength of given Acetic Acid against standard sodium hydroxide solution by Conductometric titrations
8) Determination of strength of mixture of acids against standard sodium hydroxide solution by conductometric method.
9) Verification of Beer-Lambert's law
10) Determine the strength of Cu(II) ion by colorimeter
11) Preparation of a simple polymer(PVC)
12) Preparation of Bakelite
13) Thin layer chromatography
14) Identification of simple organic compounds by IR and UV-Visible Spectroscopy graphs.
15) HPLC method in separation of liquid mixtures.

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3 1.5

(A0591201) PROBLEM SOLVING AND PROGRAMMING LAB

For Branches: CE, EEE, ME, ECE, CSE, CSE(DS), CSE&BS

COURSE OUTCOMES:

- To learn about different types of operators
- To learn how decision making is done during programming
- To learn about various simple constructs used for programming
- To learn to define functions and call them with appropriate parameters
- To understand the usage of string libraries to do common string operations
- To understand pointer referencing and pointer dereferencing

COURSE OUTCOMES:

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

- Apply the specification of syntax rules for numerical constants and variables, data types
- Know the Usage of various operators and other C constructs
- Design programs on decision and control constructs
- Develop programs on code reusability using functions
- Implement various concepts of arrays and strings

MAPPING WITH Cos & POs:

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

RECOMMENDED SYSTEMS /SOFTWARE REQUIREMENTS:

Intel based desktop PC with ANSI C Compiler and Supporting Editors

EXERCISE 1

Write a C program to demonstrate various operators used in C language.

EXERCISE 2

a) Write a C program to find the roots of a quadratic equation.
b) Write a C program to find both the largest and smallest number in a list of integers.

EXERCISE 3

a) Write a C program, which takes two integer operands and one operator from the user, performs the specified operation and then prints the result. (Consider the operators +,- ,*, /, % and use Switch Statement)
b) Write a C Program to find the reverse of a given number.

EXERCISE 4

a) Write a C program to find the sum of individual digits of a positive integer.
b) Write a C program to generate the first ‘n‘ terms of the Fibonacci sequence.

[**Note:** 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.]

c) Write a C program to generate all the prime numbers between 1 and n, where ‘n‘ value is given by the user.

[**Note:** Develop each of the above programs by using different loop constructs supported by C language. (i.e., while, do while and for Loops)]

EXERCISE 5

a) Write a C Program to mask the most significant digit of the given number.
b) Write a program which Prints the following pattern

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EXERCISE 6

a) Write a C program to find all the even numbers in the given one dimensional array.
b) Write a C program to print the elements of an array in reverse order.
c) Write a C program to construct a pyramid of numbers.

EXERCISE 7

Write a C program to perform the following operations:

a) Addition of Two Matrices
b) Multiplication of Two Matrices

[Note: Use functions to implement the above specified operations]

EXERCISE 8

Write C programs that use both recursive and non-recursive functions

a) To find the factorial of a given integer.
b) To find the GCD (greatest common divisor) of two given integers.

EXERCISE 9

a) Write a C Program to solve the Towers of Hanoi problem by using recursive function.
b) Write a C Program to demonstrate the various storage classes, which are supported by the C language. [i.e., automatic, external, static and register]

EXERCISE 10

a) Write a C Program to demonstrate that, how to pass an entire array as an argument to a function with a suitable example.
b) Write a C Program to perform various operations on given two strings using string handling functions.

EXERCISE 11

a) Write a C program that uses functions to perform the following operations:
   i) To insert a sub-string in to a given main string from the specified position.
   ii) To delete '**n**' Characters from a given position in a given string.
b) Write a C program to determine if the given string is a palindrome or not.

EXERCISE 12

a) Write a C program that displays the position or index in the string 'S' where the string 'T' begins, or – 1 if 'S' doesn't contain 'T'.
b) Write a C program to count the lines, words and characters in a given text.

EXERCISE 13

a) Write a C program to reverse the first 'n' characters in a file.
b) Write a C program to merge two files into a third file.

REFERENCE BOOKS

1) Programming in C, Pradeep Dey, Manas Ghosh, Oxford Heigher Education
2) The Spirit of C, an introduction to modern programming, M.Cooper, Jaico Publishing House.
3) Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.
4) Computer Basics and C Programming, V. Raja Raman, PHI Publications

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L	T	C
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(A0007202) DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

For Branches: CE, EEE, ME, CSE, CSE(DS), CSE&BS

COURSE OBJECTIVES:

- To familiarize the concepts of ordinary and partial differential equations.
- To equip the students to analyze vector differentiation and the evaluation of line, surface and volume integrals and their applications in electromagnetic theory, transmission lines etc.,

COURSE OUTCOMES:

After completion of the course the student will be able to:

- Obtain the knowledge of first and higher order differential equations and its use in solving Circuit analysis, heat transfer problems in engineering.
- Analyze solving higher order linear differential equations with variable coefficients and its applications.
- Understand about formation and solution of partial differential equations and importance in thermodynamics, continuum mechanics and fluid mechanics.
- Understand about vector differentiation and its applications in Electromagnetic theory.
- Apply the concept of vector integration to solve many problems in field theory, Electromagnetic theory and transmission lines.

MAPPING OF COS & POS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	-	-	-	-	-	-	-
CO2	3	2	2	3	3	-	-	-	-	-	-	-
CO3	2	2	3	2	2	-	-	-	-	-	-	-
CO4	3	2	2	3	2	-	-	-	-	-	-	-
CO5	2	3	2	2	2	-	-	-	-	-	-	-

UNIT-I

Differential equations of first order and first degree – Formation of ODEs – Solution of ODEs - Exact, Non – Exact, Linear and Bernoulli's equations – Applications of ODEs to L – R & C – R circuits.

UNIT – II

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type, e^{ax}, $\sin ax, \cos ax$, Polynomials in x, $e^{ax}V(x)$, $xV(x)$, Method of Variation of parameters.

UNIT – III

Higher Order linear Differential Equations with variable coefficients: Cauchy's and Legendre's linear Differential equations, simultaneous linear differential equations with constant coefficients.

UNIT – IV

Partial Differential Equations of First order:

First order partial differential equations, Formation of partial differential equations, solutions of first order linear and non – linear Partial differential equations. Method of separation of variables.

UNIT - V

Vector Differentiation: Introduction of Vector differentiation– Scalar and vector point functions – Gradient of scalar function– Directional derivatives – Divergence of a vector function – Curl of a vector function – Properties of Grad, Div and Curl.

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UNIT – VI

Vector integration: Line integral - Potential function – Area, Surface and volume integrals. Vector integral theorems: Green's theorem – Stoke's and Gauss Divergence Theorem (excluding their proof), Verification of Green's, Stoke's and Gauss Theorems.

TEXTBOOKS:

1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publications.
2) R. K. Jain, S. R .K. Iyengar, Advanced Engineering Mathematics, Alpha Science.
3) T.K.V. Iyengar, B. Krishna Gandhi, A Text Book of Engineering Mathematics, Vol – 1, S. Chand & Company.

REFERENCES:

1) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2) Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
3) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

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L	T	C
2	1	3

(A0009202) ENGINEERING PHYSICS

For branches: CE & Mech

COURSE OBJECTIVES:

- To provide basic concepts of interaction of light with matter, nanomaterials, ultrasonics and quantum physics to the engineering students.

COURSE OUTCOMES:

After the completion of the course the student will be able to:

- Apply the concept of light to test the material properties
- Construct a quantum mechanical model to explain the behavior of a system at the microscopic level.
- Apply the knowledge of nanomaterials in the development of nanotechnology.
- Detect the flaws present in the materials using ultrasonics
- Apply the functional materials for the benefit of mankind.

MAPPING OF COs & POs:

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

UNIT-I: WAVE OPTICS (9 h)

Interference: Introduction –Division of amplitude–Newton's rings and its applications. **Diffraction:** Introduction – Fraunhofer diffraction at single slit– Diffraction Grating– Grating spectra – Determination of wavelength of light.

UNIT-II: QUANTUM MECHANICS (9 h)

Introduction to quantum physics – Wave-Particle duality – de Broglie hypothesis – Verification of wave character of Matter waves (Davison–Germer experiment)– Uncertainty principle– Thought experiment (Electron diffraction) – Wave function (ψ) –Schrodinger's one-dimensional time-independent wave equation – Particle in 1D-potential box.

UNIT III: THE CRYSTAL STRUCTURE OF SOLIDS (9 h)

Introduction –Space lattice – Basis – Unit cell (primitive and Non-primitive) – Crystal systems – Bravais lattices –Atomic radius, Nearest neighbouring distance, Coordination numberand packing factor for SC, BCC, FCC lattices – Diamond structure – Crystal planes and directions–Miller Indices – calculation of interplanar distance.

UNIT-IV: ULTRASONICS (9 h)

Introduction – Production of ultrasonics by magnetostriction and piezoelectric method – Detection methods – Properties – Cavitation – Pulse-echo & Transmission mode of non-destructive testing (NDT) methods – General applications of ultrasonics.

UNIT-V: NANOMATERIALS (9 h)

Introduction – Properties of nanomaterials: Surface area to volume ratio and Quantum confinement – Synthesis of nanomaterials – Ball milling – Sol-gel – chemical vapour deposition (CVD) techniques– Carbon nanotubes (CNTs) –Applications.

UNIT-VI: FUNCTIONAL MATERIALS (9h)

Introduction –Fiber reinforced plastics (FRPs), Constituents of FRP reinforcement, Properties, Applications; Shape memory alloys (SMAs), Different phases, SAME (one-way and two-way), Applications.

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R G M COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

TEXT BOOKS

1) M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" AText book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.
2) R. K. Gaur and S.C. Gupta, "Engineering Physics",DhanpatRai Publications, New Delhi.

REFERENCES

1) "Concepts of Modern Physics",Arthus Beiser, Tata Mc Graw Hill Publications, New Delhi.
2) "Physics Volume – II", Resnick, Halliday and Krane, Wiley, New Delhi.
3) "Elements of Solid State Physics", J.P. Srivastava, PHI Learning, 4th eds.New Delhi.
4) "Introduction to Nanotechnology", Charles P. Poole and Frank J. Ownen, Wiley.
5) "Applied Physics", S.P.Basavaraju, Subhas Stores, Bangalore.
6) "Nanotechnology", M.Ratner & D. Ratner, Pearson Ed, New Delhi.

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AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

I B.Tech, II-Sem(ME)

L	T	C
2	1	3

(A0502202) DATA STRUCTURES

For Branches: CE, EEE, ME, ECE, CSE, CSE(DS), CSE&BS

COURSE OBJECTIVES:

- To make students aware about structures and unions in C language.
- To provide exposure on various searching and sorting techniques.
- To provide exposure on various data structures like stacks, queues, circular queues and linked lists etc.,
- To develop solutions for various problems by using C Programming.

COURSE OUTCOMES:

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

- Develop programs with user defined data types.
- Apply various file handling techniques for better data management
- Apply stacks in various applications
- Apply queues in various applications and distinguish between stacks and queues.
- Analyse various dynamic data structures.
- Implement various searching and sorting techniques

MAPPING WITH COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	3	-	2	-	-	-	2	-	-	2
CO2	3	-	3	-	-	2	-	-	-	-	2	-
CO3	3	2	-	-	-	-	3	-	-	-	-	-
CO4	-	3	-	-	-	-	2	-	-	-	-	-
CO5	3	3	2	-	-	2	3	-	-	-	-	-
CO6	3	-	-	2	3	3	-	-	-	-	-	-

UNIT I

Pointers: Pointer variable and its importance, Pointer variable declaration, initialization of pointer variables, how to access a value from a memory location through it‘s pointer variable. Arithmetic operations on pointer variables, Scale factor length. Pointers and functions - pointers as function arguments (i.e., call-by-reference), Pointers and Arrays, Pointers and Strings, Generic Pointers.

Learning Outcomes: Student should be able to

1) Explain different types of pointers and their usage. (L2)
2) Understand, solving of arithmetic operations on pointer variables (L2)
3) Apply pointers on functions, arrays and strings (L4)

UNIT II

Structure and Unions In C Language: Structures – Introduction, Features of Structures. Declaration and Initialization of Structures, Accessing structure members, structure initialization. Nested Structures, Array of Structures, Arrays within structures and Pointers to Structures, Structures and Functions, Unions, typedef. Example Programs on the topics mentioned above.

Learning Outcomes: Student should be able to

1) Use Structures and Unions in applications using C programming. (L3)
2) Apply the structures and union concepts to solve real world problems. (L2)

UNIT III

Introduction to Data Structures: Classification of data structures, dynamic memory allocation functions in C language. **Stacks:** Definition, Various representation methods, operations on stacks and their implementation in C language, applications of stacks.

Learning Outcomes: Student should be able to

1) Apply the concepts of Data structures to solve the real world problems (L4)
2) Understand the concepts of Stacks and also its applications (L2)
3) Describe the operations of Stacks. (L2)

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UNIT IV

Queues: Definition, Various representation methods, operations on queues and their implementation in C language, applications of queues. Circular queues- operations on circular queues and their implementation in C language.

Learning Outcomes: Student should be able to

1) Understand the concepts of Queues and also its applications (L2)
2) Describe the operations of Queues. (L2)

UNIT V

Linked Lists: Definition, Various representation methods, operations on linked lists and their implementation in C language.

Learning Outcomes: Student should be able to

1) Understand the concepts of Linked list (L2)
2) Use the linked lists in various operations. (L3)

UNIT VI

Searching and Sorting Techniques: Searching Techniques - Linear search and Binary Search Techniques. Sorting techniques - Bubble Sort, Selection Sort, Insertion Sort. Implementation of all the above mentioned techniques in C language and trace them by giving different test data.

Learning Outcomes: Student should be able to

1) Design the different sorting techniques (L6)
2) Use Linear search and Binary search methods. (L3)

TEXT BOOKS:

1) PradipDey and ManasGhosh, Programming in C, Oxford University Press, 2nd Edition 2011.
2) B.A.Forouzon and R.F. Gilberg, "COMPUTER SCIENCE: A Structured Programming Approach Using C", Third edition, CENGAGE Learning, 2016

REFERENCE BOOKS:

1) Byron Gottfried, "Programming with C", Schaum's Outlines, 2nd Edition, TATA McGraw-Hill.
2) M.T.Somashekara, "Problem Solving Using C", PHI, 2nd Edition 2009.
3) A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press
4) Rajaraman V., "The Fundamentals of Computers", 4th Edition, Prentice Hall of India, 2006.
5) R S Bichker, "Programming in C", University Press, 2012.

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AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

I B.Tech, II-Sem(ME)

L	T	C
2	1	3

(A0303202) MATERIAL SCIENCE

[For Mech. Engg. Only]

COURSE OBJECTIVES:

- To gain knowledge of different material crystal structures and their mechanical Properties.
- To able to understand the phase transformations of metals and its alloys with help of equilibrium diagrams.
- Able to understand the characterization of the materials.
- Able to select the suitable ferrous metals, nonferrous metals and alloys for the given application.

COURSE OUTCOMES:

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

- Understand basic concepts of crystallography of metals, material properties.
- Construct the Phase diagrams and interpret the data.
- Perform experiments to evaluate the properties of the Engineering Materials.
- Identify, formulate and solve material science and metallurgical problems.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	2	2	1	-	-	2	-	1	2	3	2	2
CO2	2	3	2	2	1	-	-	1	-	1	-	-	1	2	3	2
CO3	2	3	2	3	2	1	-	-	1	-	-	1	2	2	2	3
CO4	3	3	2	-	2	-	-	-	-	-	1	-	1	2	1	2

UNIT: I

Structure of Metals: Space lattice, Unit cell-Crystal structures (BCC, FCC and HCP)-Crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys - Mechanical properties of Engineering materials.

Constitution of Alloys: Necessity of alloying, types of solid solutions, Hume Rothery's rules.

UNIT II

Crystal Defects and Deformation of Metals: Types of imperfections: point, line and surface defects. **Deformation of Metals:** Comparison between elastic and plastic deformation of metals, Modes of Plastic Deformation: Slip, Twinning. Types of Dislocations: Edge dislocation, Screw dislocation.

UNIT III

Testing of engineering materials: Testing of materials under tension, Compression and shear loads, Hardness tests- Brinell, Vicker's and Rockwell, Impact test- Izod and Charpy tests, Fatigue and creep tests.

UNIT IV

Steels and Cast Iron: Allotropy and phase changes of pure iron- Iron-Iron carbide (Fe-Fe_3C) equilibrium diagram-Lever rule, Gibb's Rule, Types of steels- Low, medium and high carbon steels. Alloy steels-Stainless steel, Tool steels & die steels and their applications.

Cast Irons: Types- White, grey, malleable and nodular cast irons and properties and applications.

UNIT V

Heat Treatment of Alloys: Effect of alloying elements on Fe-Fe_3C system, Annealing, Spheroidizing, normalizing, Hardening, Tempering- Surface hardening methods.

UNIT VI

Non-Ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

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DEPARTMENT OF MECHANICAL ENGINEERING

TEXT BOOKS:

1) Introduction to Physical Metallurgy / Sidney H. Avener.TMH Publications,2nd Edition, 1997
2) Material Science and Engineering / V. Raghavan, 5th Edition, PHI Publications, 2011

REFERENCES:

1) Material Science and Metallurgy for Engineers by V.D kodgire, Everest publishing house, 2011.
2) Introduction to Engineering Materials, B.K Agarwal, 21st Reprint, TMH publications, 2007
3) Essential of Materials science and engineering/ Donald R.Askeland/Thomson publications, 2004
4) Engineering Materials and Metallurgy, R.K Rajput, S. Chand Ltd, 2006.

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AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

I B.Tech, II-Sem(ME)

L	T	C
2	1	3

(A0304202) BASIC ENGINEERING MECHANICS

[For Mech. Engg. Only]

COURSE OBJECTIVE:

- To apply the knowledge of mathematics, Science and Engineering and to expand this into the vast area of 'rigid body mechanics'
- To impart knowledge about the basic laws of statics and their applications in problem solving.
- To enhance the ability to design and solve open ended problems.
- To prepare the students for higher level of courses in the demine of mechanical engineering.

COURSE OUTCOMES:

After completion of the course the student will be able to

- Apply the various laws of engineering mechanics for solving simple and complex problems
- Apply analytical skills for analysing statically equilibrium problems
- Calculate and analyse the properties (C.G and M.I) of the rigid bodies and also solve problems related to friction
- Plan and conduct appropriate experimentation and interpret the data.

MAPPING OF COs & POs:

	PO	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3	2	-	-	-	2	2	-	3	2	3	2
CO2	3	2	3	2	3	1	-	-	-	2	-	-	3	2	3	2
CO3	3	2	2	1	3	1	-	-	2	2	-	1	2	2	2	2
CO4	3	2	2	2	3	1	-	-	2	2	1	-	2	-	3	2

UNIT-I

Introduction to Engineering Mechanics- classification of engineering mechanics – basic terminologies in mechanics - units and dimensions – laws of mechanics – parallelogram and triangular law of forces – Lame's theorem- principle of transmissibility – single equivalent force – simple problems

UNIT-II

Equilibrium of rigid body- composition system of forces – resolution of forces – general method of composition of forces – equilibrium of bodies – equilibrium of connected bodies – simple examples - Moment of a force – Varignon's theorem – couple – resultant of non-concurrent force system- x and y intercept of resultant- simple problems

UNIT-III

Support Reactions- introduction – types of supports – types of loading – analytical method for finding out the reactions of a beam – simple problems on simply supported beams, overhanging beams and roller and hinged supports beams.

UNIT-IV

Center of gravity and centroid – Determination of areas – First moment of area and the centroid of sections – Rectangle, circle, triangle from integration – T-section, I-section, angle section, hollow sections by using standard formula

UNIT-V

Area moment of inertia and mass moment of inertia – Introduction – radius of gyration – theorem of perpendicular axis – theorem of parallel axis – second moment of area – rectangle, circle, triangle from integration – T-section, I-section, angle section, hollow section by using standard formula – polar moment of inertia – mass moment of inertia

UNIT-VI

Friction- Introduction - Types of friction - laws of Coulomb friction – Frictional force –Angle of repose –Equilibrium of a body lying on rough inclined plane – Analysis of ladder friction – Analysis of wedge friction

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TEXT BOOKS

1) Engineering Mechanics by Shames & Rao – Pearson Education, 2005
2) Engineering Mechanics by Dr.R.K.Bansal, Lakshmi Publications, 2009
3) Engineering Mechanics – B. Bhattacharyya, Oxford University Publications, 2008
4) Engineering mechanics by S S Bhavikatti, New age International Publications, 2017.

REFERENCE BOOKS:

1) Engineering Mechanics by FedrinandL.Singer – Harper Collings Publishers, 1994
2) Engineering Mechanics by SeshigiriRao, Universities Press, Hyderabad, 2005
3) Engineering Mechanics by Rajsekharan, Vikas Publications, 2005
4) Engineering Mechanics (Statics and Dynamics) by Hibller and Gupta; Pearson Education, 2016
5) Engineering Mechanics by S.Timoshenko, D.H.Young and J.V.Rao, Tata McGraw-Hill Company, 2013
6) Engineering Mechanics by Chandramouli, PHI publications, 2011
7) Engineering Mechanics –Arthur P. Boresi and Richard J. Schmidt. – Brooks/Cole – Cengage, 2002.

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DEPARTMENT OF MECHANICAL ENGINEERING

I B.Tech, II-Sem(ME)

L	T	C
2	0	0

(A0010202) ENVIRONMENTAL SCIENCE

(Mandatory Learning Course)

For branches: CE, EEE, ME, ECE, CSE, CSE(DS), CSE&BS

COURSE OBJECTIVES:

- Creating the awareness about environmental problems among people.
- Imparting basic knowledge about the environment and its allied problems.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- Environmental education should have an interdisciplinary approach by including physical, chemical, biological as well as socio-cultural aspects of the environment. It should build a bridge between biology and technology.

COURSE OUTCOMES:

- Understand environmental problems arising due to developmental activities.
- Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
- Identify the natural resources and suitable methods for conservation of environment.
- Identify the environmental pollutants and abatement devices.
- Adopt practices that help in promoting balance in nature by making judicious utilization of recourses.

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL SCIENCE

Environment - Definition, Scope, Importance and Need for public awareness. Segments of Environment (Atmosphere, Lithosphere, Hydrosphere and Biosphere).

UNIT II RESOURCES AND UTILIZATION

Renewable and Non-renewable resources.

a) Natural Resources: Soil &Water sources (conflicts of over utilization of water Resources - Hydro power project-problems), forest & mineral resources – Utilization-problems.
b) Non-conventional resources of energy(Solar Energy, wind energy and their applications)

UNIT III

a) **CONCEPTS OF ECO-SYSTEM**
   Structure and functions of an ecosystem: Producers, Consumers and Decomposers- Interaction between biotic and abiotic factors in an ecosystem- Trophic levels- Food chain- Food web –Ecological Pyramid.
b) **TYPES OF ECOSYSTEM**
   Understanding the types of ecosystem: (i) Terrestrial (forest)(ii) Aquatic – (Marine)

UNIT IV BIODIVERSITY

Introduction – Definition – Value of biodiversity- Biodiversity at global, National and Local levels- India as a mega diversity nation-Hot-spots of biodiversity-Threats to biodiversity- IUCN Red data book - Conservation of bio diversity (Insitu and Exsitu conservation methods).

UNIT V ENVIRONMENTAL POLLUTION

Introduction- Causes, effects and control measures of

a) Air pollution
b) Water pollution
c) Soil pollution
d) Noise pollution
e) Plastic pollution

Disaster management: Floods, Earthquake.

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UNIT-VI

HUMAN POPULATION ISSUES

a) Demography-problems related to Population explosion- Age structure-Family welfare and family planning programme
b) Diseases- AIDS, Malaria, COVID, Cancer.
c) Human rights, Fundamental duties and Value of education.

ENVIRONMENTAL ISSUES

a) Climatic changes
b) Greenhouse effect and global warming.
c) Ozone layer depletion.
d) Acid rain.

TEXT BOOKS:

1) Deswal, S and Deswal A., (2004), A Basic Course in Environmental Studies, DhanpatRai & Co. Delhi.
2) Anubha Kousik and C P Kousik., New age international publishers.

REFERENCES:

1) Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,
3) Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
4) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5) Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)

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AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

I B.Tech, I-Sem(ME) P 3 C 1.5

(A0592201) ENGINEERING WORKSHOP & IT WORKSHOP

For Branches: CE, EEE, ME, ECE, CSE, CSE(DS), CSE&BS

ENGINEERING WORKSHOP

COURSE OBJECTIVES:

- To familiarize with the basic manufacturing processes and to study the various tools and equipment used, hands-on training is given in different sections. Essentially student should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work.

COURSE OUTCOMES:

At the end of the Engineering Work Shop:

- A student should know the basic knowledge of various tools and their use in different sections of manufacturing such as fitting, carpentry, tin smithy, welding etc. and basic engineering practices such as plumbing, electrical wiring, electronic circuits, machine shop practice.
- Ability to design and model various basic prototypes in the trade of fitting such as Straight fit, V- fit.
- Ability to make various basic prototypes in the trade of Tin smithy such as rectangular tray, and open Cylinder.
- Ability to perform various basic House Wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch, connecting a fluorescent tube, Series wiring, Go down wiring.

MAPPING OF COs& POs:

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

Note: At least two exercises should be done from each trade.

1. TRADES FOR EXERCISES:

A] Carpentry

1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint
4. Mortise and Tennon Joint

B] Fitting

1. Vee Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

C] House Wiring

1. Parallel / Series Connection of two/three bulbs
2. Stair Case wiring
3. Tube Light Wiring
4. Measurement of Earth Resistance/Go down Wiring

D] Tin Smithy

1. Rectangular Tray
2. Square Box without lid
3. Open Scoop
4. Funnel

E] Welding

1. Single V butt joint
2. Lap joint

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3. Double V butt joint
4. T fillet joint.
5. Gas Welding

F] Soldering

1. Soldering & Desoldering Practice
2. Series Circuit
3. Parallel Circuit

2. TRADES FOR DEMONSTRATION:

a) Plumbing
b) Machine Shop
c) Bosch Power Tools

REFERENCE BOOKS:

1. Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009.
2. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers, 2013
3. Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, 4/e Vikas, 2009
4. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House, 1999.

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DEPARTMENT OF MECHANICAL ENGINEERING

IT WORKSHOP

COURSE OBJECTIVES:

- The modules include training on PC Hardware, and Productivity tools including text processor, spread sheet, presentation tools. It enables the students to understand and fix the common hardware, software issues & makes the students to install either Windows or UNIX based Operating system in the machines.
- Enable students to understand how computers work, different types of computers, functions of applications, input and data storage devices, different operating systems,
- It makes the students to understand and use the common office suite tools like word, excel etc. effectively in their daily usage.

COURSE OUTCOMES:

By the end of module students will be expected to demonstrate

- PC Hardware- introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer. The students should work on working PC to disassemble and assemble to working condition.
- To do installation of system software like MS Widows and Linux and the required device drivers.
- Productivity tools- module would enable the students in crafting professional word documents; excel spread sheets and power point presentations using the Microsoft suite of office tools.

MAPPING WITH COs & POs:

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

PC HARDWARE

Exercise 1 - Identify the peripherals of a computer, components in a CPU and its functions.

Exercise 2 - Every student should disassemble and assemble the PC back to working condition.

Exercise 3 – Every student should individually install MS windows on the personal computer and also install Linux as dual boot with Windows.

OFFICE TOOLS

Exercise 4 - Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office equivalent tool word: Importance of LaTeX and MS office tool Word as word Processors, Details of the four tasks and features that would be covered in each. Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 1-Task III: Using Word Processor to create project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

SPREAD SHEET

Exercise 5–Spread Sheet Orientation: The mentor needs to tell the importance of MS office 2007,2010/ equivalent tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1-Task III: Features to be covered: - Gridlines, Format Cells, Summation, auto fill, Formatting Text, Formulas, Functions

PRESENTATION

Exercise 6 -Students will be working on basic presentation utilities and tools which help them create basic power point presentation. Topic covered during this Exercise includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

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REFERENCES:

1) Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2) LaTeX Companion – Leslie Lamport, PHI/Pearson.
3) Introduction to Computers, Peter Norton, 6/e Mc Graw Hill
4) Upgrading and Repairing, PC's 18th e, Scott Muller QUE, Pearson Education
5) Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dreamtech
6) IT Essentials PC Hardware and Software Companion Guide, Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.

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R G M COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

I B.Tech, II-Sem(ME) P 3 C 1.5

(A0093201) ENGINEERING PHYSICS LAB

For branches: CE, EEE, ME, ECE, CSE, CSE(DS), CSE&BS

COURSE OBJECTIVES:

- The laboratory should help the student to develop a broad array of basic skills and tools of experimental physics and data analysis.
- The laboratory should help students to understand the role of direct observation in physics and to distinguish inferences based on theory and the outcomes of experiments.
- To learn about the optical experiments in establishing the fundamentals in Interference and Diffraction phenomena which will be visualized with the light and laser experiments mentioned in the syllabus.
- To learn about the basic electronic experiments such as energy band gap determination, Hall Effect to know the type of extrinsic semiconductors, Stewart-Gee's experiment in field intensity determination and Solar I-V characteristics.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Operate optical instruments like microscope and spectrometer
- Estimate the wavelength of different colors using diffraction grating
- Study the variation of intensity of the magnetic field due to circular coil carrying current with distance
- Identify the type of semiconductor (i.e., n-type or p-type) using Hall Effect

MAPPING OF COs & POs:

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

LIST OF EXPERIMENTS (Any10 Experiments)

1) Determination of radius of curvature of a given plano-convex lens using Newton's rings method.
2) Determination of thickness of a thin wire/film by Wedge shape method.
3) Determination of wavelength of spectral lines using Transmission Grating and Spectrometer.
4) Determination of wavelength of a sodium light by normal incidence method.
5) Determination of dispersive power of a prism using spectrometer.
6) Determination of wavelength of a laser using transmission grating.
7) Determination of particle size by laser diffraction.
8) Determination of numerical aperture of an optical fiber.
9) Study of variation of magnetic field along the axis of a circular coil carrying current using Stewart and Gee's method.
10) Determination of rigidity modulus of a given wire using Torsional Pendulum.
11) Determination of energy band gap of a Si or Ge semiconductor by Four probe method.
12) Study of B – H Curve of a ferromagnetic material.
13) Determination of carrier density and Hall coefficient or magnetic flux density of an extrinsic semiconductor using Hall effect.
14) Study current (I) and voltage (V) characteristics of a Solar Cell.
15) Measurement of Curie temperature of a given ferroelectric material by studying the temperature dependence of dielectric constant.

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R G M COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

I B.Tech, II-Sem(ME) P 3 C 1.5

(A0593202) DATA STRUCTURES LAB

For Branches CE, EEE, ME, ECE, CSE, CSE(DS), CSE&BS

COURSE OBJECTIVES:

- To understand how to use structures and unions as a compound data types
- To understand various basic file operations
- To understand various stack and queue operations
- To understand various linked list operations
- To understand basic searching and sorting techniques

COURSE OUTCOMES:

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

- Develop applications on user defined data types
- Apply dynamic memory allocation through pointers
- Use different data structures for create/update basic data files
- Implement linear data structures through stacks and queues
- Implement various searching and sorting techniques, Linked lists.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	3	-	2	-	-	-	2	-	-	2
CO2	3	-	3	-	-	2	-	-	-	-	2	-
CO3	3	2	-	-	-	-	3	-	-	-	-	-
CO4	-	3	-	-	-	-	2	-	-	-	-	-
CO5	3	3	2	-	-	2	3	-	-	-	-	-

RECOMMENDED SYSTEMS /SOFTWARE REQUIREMENTS:

Intel based desktop PC with ANSI C Compiler and Supporting Editors

EXERCISE 1

a) Write a C Program to perform various arithmetic operations on pointer variables.
b) Write a C Program to demonstrate the following parameter passing mechanisms:
   i) Call-by-value
   ii) Call-by-reference

EXERCISE 2

a) Write a C Program to copy the contents of one structure variable to another structure variable.
b) Write a C program to implement nested structure to store and display the student information. The structure student contains the field‘s S.no, name, and date. Date is the nested structure and it contains the fields day, month and year.

EXERCISE 3

a) Write a C program to add two distances which is in feet and inches
b) Write a C program to illustrate passing the whole structure as argument to a function.

EXERCISE 4

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

a) Reading a complex number
b) Writing a complex number
c) Addition of two complex numbers
d) Multiplication of two complex numbers (Note: represent complex number using a structure.)

EXERCISE 5

a) Write a C program to implement Union Concept.
b) Write a C program which copies last ‘n‘ characters from one file to another.

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EXERCISE 6

Write a C program to implement the following operations on Stack using array representation

a) Push
b) Pop
c) Display

EXERCISE 7

Write a C program to implement the following operations on Queue using array representation

a) Insert
b) Delete
c) Display

EXERCISE 8

Write a C program to implement the following operations on Singly Linked list using linked representation

a) Insert
b) Delete
c) Display
d) Search

EXERCISE 9

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order.

a) Bubble sort
b) Selection sort
c) Insertion sort

EXERCISE 10

Write C program to implement the following searching methods to search an element in a given list of integers

a) Linear Search
b) Binary Search

REFERENCE BOOKS:

1) Programming in C, Pradeep Dey, Manas Ghosh, Oxford Heigher Education
2) Computer programming and Data Structures, E.Balaguruswamy, Tata Mc Graw Hill. 2009 revised edition.
3) Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.

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R G M COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

INSTITUTE VISION

- To develop this rural based engineering college into an institute of technical education with global standards
- To become an institute of excellence which contributes to the needs of society
- To inculcate value based education with noble goal of "Education for peace and progress"

INSTITUTE MISSION

- To build a world class undergraduate program with all required infrastructure that provides strong theoretical knowledge supplemented by the state of art skills
- To establish postgraduate programs in basic and cutting edge technologies
- To create conductive ambiance to induce and nurture research
- To turn young graduates to success oriented entrepreneurs
- To develop linkage with industries to have strong industry institute interaction
- To offer demand driven courses to meet the needs of the industry and society
- To inculcate human values and ethos into the education system for an all-round development of students

INSTITUTE QUALITY POLICY

- To improve the teaching and learning
- To evaluate the performance of students at regular intervals and take necessary steps for betterment
- To establish and develop centres of excellence for research and consultancy
- To prepare students to face the competition in the market globally and realize the responsibilities as true citizen to serve the nation and uplift the country's pride.

VISION OF THE DEPARTMENT

- To be a center of excellence by offering UG, PG and Research programs in cutting edge technologies of Mechanical Engineering in collaboration with industries.

MISSION OF THE DEPARTMENT

- To Produce Mechanical Engineers who are exceptionally competent, disciplined and have a sense of devotion to their profession by adapting modern teaching and learning process.
- To establish modern laboratory facilities to impart quality education in association with Industry-Institute interaction.
- To inculcate research orientation among the student community

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

1) PEO-1 is Consistent with the mission statement that the Mechanical Engineers who are exceptionally competent to face the challenges in Mechanical engineering stream
2) PEO-2 is consistent with mission statement that, the Mechanical Engineers are able to design and construct mechanical systems with industry collaboration
3) PEO-3 is consistent with the mission statement that, the mechanical engineers have an ethical attitude and have an interest towards research
4) PEO-4 is Consistent with the mission statement that, the mechanical engineers can learn leadership quality and entrepreneurial skills when they are working with industry

PROGRAM SPECIFIC OUTCOMES

1) The graduate will be able to design systems, components or process for broadly defined engineering technology problems appropriate to programme educational objectives.
2) The graduates will be able to apply modern engineering tools viz., CAD/CAM packages for modeling, analysis and predicting simple to complex engineering activities with an understanding of the limitations.
3) The graduate will be able to apply oral and graphical communication in both technical and non-technical environment.
4) The graduate will be able to engage in self-directed continuing professional develop strong commitment to address ethical and professional responsibilities

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PROGRAM OUTCOMES

Engineering Graduates will be able to:

1) Engineering knowledge: Apply the knowledge of mathematics, science, and engineering specialization to the solution of complex engineering problems.
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.
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.
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.
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.
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.
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.
8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9) Individual and team work: Function effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings.
10) Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
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 multi-disciplinary environments.
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.

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R G M COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

NANDYAL-518501, KURNOOL DIST., A.P., INDIA

DEPARTMENT OF

MECHANICAL ENGINEERING (M.E)

EDUCATION FOR PEACE

(ESTD-1995)

II B.TECH SYLLABUS 2020

Applicable for students admitted into
B.Tech (Regular) from 2020-2021
B.Tech (Lateral Entry Scheme) from 2
REGULATIONS, Course Structure & Detaile

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DEPARTMENT OF MECHANICAL ENGINEERING

Table: Course pattern

Year	Semester	No. of Subjects		Number of Labs		Total credits	
		CSE/CSE(DS) and CSE &BS/EEE	ECE/CE/**Mech.**	CSE/CSE(DS) and CSE &BS/EEE	ECE/CE/Mech.		
First	First	1.BSC1 –LA&AC 2.BSC2-Applied Physics 3.ESC1-PSP (C programming) 4.ESC2-BEE/BEE/BEE/FED 5.ESC3-ED	1.BSC1 –LA &DE/LA&AC/LA&AC 2.BSC2-MEC/AC/AC 3.ESC1-PSP (C programming) 4. ESC2-FEE/EM /ED 5.HSS-English	1.ESC Lab-E&ITW 2. BSC Lab (Engg. Physics) 3.ESC Lab(PSP)	1.HSC Lab-(DE Language) 2.BSC Lab(EC lab) 3.ESC Lab-(PSP)	Subjects-5X3=15 Labs-3X1.5=4.5	**19.5**
	Second	1.BSC1 –DE&VC 2.BSC2-MEC 3.ESC1-DS 4. ESC2-MFCS/MFCS/MFCS/BEE 5.HSS- English 6. Mandatory Learning course (ML)-ES	1.BSC1-AC&TT/DE&VC 2.BSC2-AP/EP/EP 3.ESC1-DS 4.ESC2-NWA/BEEE/MS 5.ESC3-ED/ED/BEM 6.Mandatory Learning course(ML)-ES	1.HSC Lab(DE Language) 2.BSC Lab-(EC) 3.ESC Lab-(DS)	1.ESC Lab-E&ITW 2. BSC Lab (Engg. Physics) 3.ESC Lab(DS)	5X3=15 3X1.5=4.5 MLX0=00	**19.5**
Second	First	1.BSC 2.PCC 3. PCC 4. PCC 5. PCC 6.PCC Lab 7. PCC Lab 8. PCC Lab 9.Skill oriented course 10. Mandatory Learning course (ML)	1.BSC 2.PCC 3. PCC 4. PCC 5. PCC 6.PCC Lab 7. PCC Lab 8. PCC Lab 9.Skill oriented course 10. Mandatory Learning course (ML)	Subjects Labs SDC/VAC EAA		5X3=15 3x1.5=4.5 1x2.0=2.0 NC	**21.5**
	Second	1.ESC 2.BSC/PCC 3. PCC 4.PCC 5. HSS 6.ESC/PCC (Interdisciplinary) Lab 7.PCC Lab 8. PCC Lab 9.Skill oriented course	1.ESC 2.BSC/PCC 3. PCC 4.PCC 5. HSS 6.ESC/PCC (Interdisciplinary) Lab 7. 6.PCC Lab 8. PCC Lab 9.Skill oriented course	Subjects Labs SDC/VAC EAA Mandatory Learning Course-1/2/3 (ECE/CSE&EEE/CE&ME) (Indian Heritage, Culture Tradition)Mandatory Learning Course-3 (Constitution of India)		5X3=15 3X1.5=4.5 1x2.0=2.0 NC NC	**21.5**
Third	First	1.PCC 2.PCC 3. PCC 4.OEC/JOE 5. PEC 6. PCC Lab 7. PCC Lab 8 Skill Advanced Course/Soft Skill Course. 9. Mandatory Learning course (ML) 10.summer Internship(2 Months) after second year to be evaluated during 5th semester (Mandatory)	1.PCC 2.PCC 3.PCC 4.OEC/JOE 5. PEC 6. PCC Lab 7. PCC Lab 8 Skill Advanced Course/Soft Skill Course. 9. Mandatory Learning course (ML) 10.summer Internship(2 Months) after second year to be evaluated during 5th semester (Mandatory)	Subjects OEC/JOE Labs SDC/VAC Mandatory Learning Course-1/2/3 (ECE/CSE&EEE/CE&ME) (Indian Heritage, Culture Tradition) Summer Internship		4X3=12 1X3=3.0 2X1.5=3.0 1x2=2.0 NC 1X1.5=1.5	**21.5**
	Second	1.PCC 2.PCC 3. PCC 4.OEC/JOE 5. PEC 6. PCC Lab 7. PCC Lab 8. PCC Lab 8 Skill Advanced Course/Soft Skill Course. 9. Mandatory Learning course (ML)	1.PCC 2.PCC 3. PCC 4.OEC/JOE 5. PEC 6. PCC Lab 7. PCC Lab 8. PCC Lab 8 Skill Advanced Course/Soft Skill Course. 9. Mandatory Learning course (ML)	Subjects OEC/JOE Labs SDC/VAC Mandatory Learning Course-1/2/3 (ECE/CSE&EEE/CE&ME) (Indian Heritage, Culture Tradition)Mandatory Learning Course-3 (Constitution of India)		4X3=12 1X3=3.0 3x1.5=4.5 1X2.0=2.0 NC	**21.5**
Fourth	First	1.PEC 2.PEC 3. PEC 4.OEC/JOE 5. OEC/JOE 6. Skill Advanced Course/Soft Skill Course. 7. HSSE	1.PEC 2.PEC 3. PEC 4.OEC/JOE 5. OEC/JOE 6. Skill Advanced Course/Soft Skill Course. 7. HSSE	Subjects OEC/JOE SDC/VAC HSSE Comprehensive Viva Industrial/Research Internship 2 Months(Mandatory) after third year evaluated during VII semester Comprehensive Viva Voce		3X3=09 2X3=06 1X2=02 1X2=02 1X1=01 1X2=02 1X1-01	**23**
	Second	Technical Seminar Internship in Industry Major Project	Technical Seminar Internship in Industry Major Project			1X01=01 1X05=05 1X06=06	**12**
						TOTAL CI	

MLC-2: II-I – Constitution of India, MLC-3: III-I: Universal Human Values, MLC-4: III-II: Indian Heritage Culture Tradition

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DEPARTMENT OF MECHANICAL ENGINEERING

II B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
			Theory	Tutorial	Lab		Internal	External	Total
THEORY									
	BSC	Numerical Methods & Probability Theory	2	1	0	3	30	70	100
	PCC	Engineering Thermodynamics	2	1	0	3	30	70	100
	PCC	Mechanics of Solids	2	1	0	3	30	70	100
	PCC	Manufacturing Process	2	1	0	3	30	70	100
	PCC	Fluid Mechanics & Hydraulic Machinery	2	1	0	3	30	70	100
PRACTICALS									
	PCCL	Materials Science & Mechanics of Solids Lab	0	0	3	1.5	25	50	75
	PCCL	Manufacturing Process Lab	0	0	3	1.5	25	50	75
	PCCL	Fluid Mechanics & Hydraulic Machinery Lab	0	0	3	1.5	25	50	75
SKILL DEVELOPMENT COURSE & MLC									
	SDC	Design Thinking	2	1	0	2	30	70	100
	MLC	Constitution of India	2	1	0	0	-	-	-
		Total	**14**	**7**	**09**	**21.5**	**255**	**570**	**825**

II B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Course Category	Name of the Subject	Hours/Week			Credits	Marks		
			Theory	Tutorial	Lab		Internal	External	Total
THEORY									
	ESC	Basic Electrical & Electronics Engg.	2	1	0	3	30	70	100
	ESC/PCC	Python Programming	2	1	0	3	30	70	100
	PCC	Kinematics of Machinery	2	1	0	3	30	70	100
	PCC	Applied Thermodynamics	2	1	0	3	30	70	100
	HSS	Industrial Management & Accountancy	2	1	0	3	30	70	100
PRACTICALS									
	ESCL	Basic Electrical & Electronics Engg. Lab	0	0	3	1.5	25	50	75
	ESC/PCCL	Python Programming Lab	0	0	3	1.5	25	50	75
	PCCL	Thermal Engineering Lab	0	0	3	1.5	25	50	75
SKILL DEVELOPMENT COURSE & MLC									
	SDC	Aptitude Arithmetic Reasoning & Comprehension	2	1	0	2	30	70	100
		Total	**12**	**6**	**9**	**21.5**	**255**	**570**	**825**

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R G M COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, I-Sem. (M.E)

L	T	C
2	1	3

( ) NUMERICAL METHODS AND PROBABILITY THEORY

(For branches C.E & Mech.)

COURSE OBJECTIVES:

- To familiarize the students with the foundations of probability and Numerical methods.
- To impart probability concepts and Numerical methods in various applications in Engineering.

COURSE OUTCOMES:

After completion of the course the student will be able to:

- Understand various Numerical methods to solve transcendental equations and rate of convergence. Analyze the concept of Interpolation its applications in digital image processing, computer graphics and in many engineering disciplines.
- Understand the concept of Numerical differentiation and integration and its importance in mechanics.
- Identify various numerical methods to solve linear and non-linear ordinary differential equations and its applications in non-linear analysis.
- To know the importance of probability, random variables and distributions in solving various mechanical and civil engineering problems.

MAPPING OF COs & POs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	2	-	-	-	-	-	-	-
CO2	3	3	2	2	3	-	-	-	-	-	-	-
CO3	2	3	2	3	2	-	-	-	-	-	-	-
CO4	3	2	3	2	3	-	-	-	-	-	-	-
CO5	2	3	2	3	3	-	-	-	-	-	-	-

UNIT-1

Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

UNIT-2

Interpolation: Introduction – Finite differences – Forward Differences – backward Differences – Newton's forward and backward difference formulae for interpolation – Gauss forward and backward difference formulae for interpolation - Lagrange's Interpolation formula.

UNIT-3

Numerical Differentiation – Numerical Integration – Newton-cote's integration formula – Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations – Euler's Method – Runge – Kutta Method.

UNIT-4

Curve fitting: Fitting a straight line – Second degree curve – Exponential curve-Power curve by method of least squares.

UNIT-5

Basic concept of probability – Random variables – Expectation – Discrete and continuous distributions.

UNIT-6

Distribution functions: Binomial Distribution – Poison Distribution and Normal Distribution – Related properties.

TEXTBOOKS:

1) Iyengar T.K.V., Krishna Gandhi B., Rangantham S., and Prasad M.V.S.S.N., (2006), "Mathematical Methods", S. Chand & Company, India.
2) Iyengar T.K.V., Krishna Gandhi B., Rangantham S., and Prasad M.V.S.S.N., (2015), "Probability and Statistics", S. Chand & Company, India.

REFERENCES:

1) Erwin kreyszig., (2011), "Advanced Engineering Mathematics", 10th Edition, John Wiley & Sons, United States
2) Ramana B.V., (2010), "Higher Engineering Mathematics", Tata McGraw Hill N... rint, India

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3) Kandasamy P., Thilagavathy K., and Gunavathi K., (2012), 2nd Edition, Numerical Methods, S. Chand & Company, Reprint India
4) Sastry S.S., (2005), 4th Edition, "Introductory methods of numerical analysis"., PHI.
5) Grewal B.S., (2010), 35th Edition, "Higher Engineering Mathematics"., Khanna Publishers, India

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R G M COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, I-Sem (M.E)

L	T	C
2	1	3

() ENGINEERING THERMODYNAMICS

(Use of Standard Steam Tables, Mollier Diagram & Psychometric Chart are Permitted in End Examinations**)**

COURSE OBJECTIVES:

The students completing this course are expected:

- Concepts of heat, work, energy and governing rules for conversion of one form to other.
- Applications of I & II law of thermodynamics.
- To understand concept of entropy for identifying the disorder and feasibility of a thermodynamic process.
- To familiarize steam properties to understand working of steam power plants.
- To familiarize psychometric properties to understand working of Refrigeration and Air conditioning systems.

COURSE OUTCOMES:

Students who have done this course will have a good idea of the basics of thermodynamics.

- The students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions.
- The students will be able to evaluate the performance of energy conversion devices based on I and II law of thermodynamics.
- The students can evaluate changes in thermodynamic properties of substances.
- The students will be able to analyse the cycles for utilization in internal combustion engines.

MAPPING OF COs & POs:

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	3	2	2	-	1	-	-	2	-	1	2	2	-	-	-
CO2	3	3	3	3	3	2	1	-	2	2	2	2	2	-	1	1
CO3	1	3	3	3	3	2	1	-	2	2	1	2	2	-	1	1
CO4	1	3	2	2	-	1	-	-	2	-	1	-	2	-	-	1

UNIT-1

Basic Concepts and Definitions: Classical and statistical thermodynamics, definitions of thermodynamic terms, quasi – static process, point and path functions, forms of energy, ideal gas and real gas, Zeroth law of thermodynamics.

Work and Heat: Non flow (P.dV) or displacement work in various reversible processes, Heat Transfer, comparison of work and heat.

UNIT-2

First Law of Thermodynamics: First law for a closed system undergoing a cycle and for a process, Joules experiment, PMM-I.

First Law Applied to Non-Flow and Flow Process, Corollaries and limitations of First Law of Thermodynamics. Simple problems.

UNIT-3

Second Law of Thermodynamics: Kelvin-Plank statement, Clausius statement, equivalence of Kelvin-plank and clausius statements, Heat engine, heat pump and refrigerator, reversibility and irreversibility, Carnot Cycle, Carnot's Theorem, PMM-II - simple problems.

UNIT-4

Entropy: Clausius theorem, Definition of entropy, principle of entropy increase, T-s plot, change in entropy in various reversible processes.

Availability & Irreversibility: Definition of; exergy and energy, Availability in steady flow, non-flow processes and irreversibility.

UNIT-5

Properties of Steam : Formation of steam form ice to super-heated steam with reference to T-V, P-V & T-S diagrams, properties of steam, Quality of steam, expressions for the change in internal energy, enthalpy, work, heat, entropy in various processes, Use of steam Tables and Mollier's chart. Simple problems.

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DEPARTMENT OF MECHANICAL ENGINEERING

UNIT-6

Psychometry

Definitions of - Dry Bulb temperature, Wet-Bulb Temperatures, Specific humidity (or) Humidity Ratio, Dew Point Temperature, Degree of Saturation, Relative Humidity, Sensible Heating, Sensible cooling, Humidification and Dehumidification. Measurement of psychometric properties using psychometric chart. Simple Problems.

TEXT BOOKS:

1) P.K. Nag Engineering Thermodynamics, 6th Edition 2019 Tata McGraw Hill, New Delhi.
2) Cengel, Thermodynamics – An Engineering Approach, 6th Edition 2019 Tata McGraw Hill, New Delhi.
3) Engineering Thermodynamics – Prof. K.Rama Krishna, Anuradha Pulications.

REFERENCE BOOKS:

1) B.P Mistra, Engineering Thermodynamics.
2) E. Ratha Krishna, Fundamentals of Engineering Thermodynamics, PHI Publishers, New Delhi.
3) Thermodynamics – Yadav" Central Publishers.

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AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, I-Sem (ME)

L	T	C
2	1	3

() MECHANICS OF SOLIDS

COURSE OBJECTIVES:

- To impart basic principles of solid mechanics and their associated laws.
- To understand the behaviour of engineering materials for different types of loads
- To understand the behaviour of beams under different types of loads
- To understand the nature of stresses developed in material under complex loading system
- To analyse the cylindrical shells under circumferential and radial loading conditions

COURSE OUTCOMES:

Upon completion of this course, the students can able to

1. Determine the deformations, stresses and strains in members subjected to the axial and thermal load.
2. Evaluate and explain the variations of the shear forces and bending moments along the axis of the beam
3. Use the bending stress concept to design the machine and structural components.
4. Evaluate the deflections at various points in the beam and determine the critical buckling loads of columns under different boundary conditions.
5. Analyse the principal stresses/strains and visualize the variations of normal and shear stresses in components.
6. Apply the knowledge of thin cylinders in the design of boilers, pressure vessels, and low pressure processing equipment etc., used in various industries.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1	-	1	2	-	-	-	2	2	2	-	-	-
CO2	3	3	2	3	-	2	2	-	1	1	2	3	3	-	3	1
CO3	3	3	3	2	-	2	2	2	1	1	1	3	3	-	2	1
CO4	3	3	3	2	-	2	2	2	1	1	-	3	3	-	1	1
CO5	3	3	3	2	-	2	2	2	1	-	-	3	3	-	-	1
CO6	3	3	3	2	-	2	2	2	1	-	-	3	3	-	1	1

UNIT- I

SIMPLE STRESSES & STRAINS: Rigid and Deformable bodies – Strength, Stiffness and Stability – Stresses; Tensile, Compressive and Shear – Deformation of simple and compound bars under axial load – Thermal stress – Elastic constants – Strain energy and unit strain energy – Strain energy in uniaxial loads.

UNIT –II

SHEAR FORCE AND BENDING MOMENT: Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Cantilever, Simply supported and Overhanging beams subjected to point loads, UDL, Uniformly varying loads and combination of these loads- Point of Contra flexure- Relation between S.F, B.M and rate of loading at a section of a beam.

UNIT –III

FLEXURAL STRESSES: Theory of simple bending- Assumptions- Derivation of bending equation (M/I = f/y = E/R) – Neutral axis- Determination of Bending stresses- section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections.

UNIT- IV

BEAM DEFLECTION: Elastic curve of Neutral axis of the beam under normal loads – Evaluation of beam deflection and slope: Double integration method, Macaulay Method.

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Columns: End conditions – Equivalent length of a column – Euler's equation – Slenderness ratio – Rankin's formula for columns.

UNIT- V

PRINCIPAL STRESSES & STRAINS: Principal stresses and Principal planes, Method of determining stresses on oblique sections, Mohr's circle.

UNIT -VI

CYLINDERICAL SHELLS: Thin cylindrical shells – Derivation of formula for longitudinal and circumferential stresses –hoop, longitudinal stresses and volumetric strains.

TEXT BOOKS:

1. S. Ramamrutham, Strength of materials, 16th Edition, Dhanpat Rai publications, 2011.
2. R.K. Bansal, Strength of Materials, 4th Edition, Laxmi publications (P) ltd, 2017.
3. James M. Gere, Barry J. Goodno, Mechanics of materials, 7th edition, Cengage learning, 2009.

REFERENCES:

1. Nash W.A, Theory and problems in Strength of Materials, Schaum Outline Series, McGraw-Hill Book Co,
2. Strength of materials by Bhavikatti, Lakshmi Publications.
3. Engineering Mechanics of Solids by Popov E.P, Prentice-Hall of India, New Delhi.
4. Mechanics of solids by Timo shenko,TMH Publications.
5. Singh D.K "Mechanics of Solids" Pearson Education.
6. Beer F. P. and Johnston R, Mechanics of Materials, McGraw-Hill Book Co, Third Edition.

R G M COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, I-Sem (M.E)

L	T	C
2	1	3

() MANUFACTURING PROCESS

COURSE OBJECTIVES:

- The primary objective of this course is to introduce the concept of manufacturing technology with the help of various processes widely employed in industries.
- The course consists of casting, welding, sheet metal forming, extrusion and forging processes with the related details of equipment and applications.
- To understand various metal working process. To appreciate the capabilities, advantages and the limitations of the processes.
- To understand the various concepts of metal forming and forging along with their applications.

COURSE OUTCOMES:

After completing the course, the student can able to;

- Design patterns, cores and gating system for metal casing.
- Acquire knowledge and hands-on competence in applying the concepts of manufacturing science in the design and development of mechanical systems.
- Design near net shaped components from metal to meet societal needs within realistic constraints.
- Develop joints using solid state and fusion joining and soldering techniques and also able to develop components form plastic.

MAPPING OF COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3				3	2	2	-	3	2	1	-	3	3	2	1
CO2	3				3	2	2	-		1	3	-	2	3	2	-
CO3	3				2	2	2	-	3	2	3	-	3	3	2	-
CO4	3				3	2	2	-	2	1	3	-	3	3	2	-

UNIT-1

METAL CASTING PROCESSES: Introduction, Steps involved in making a casting, casting terms, Pattern making - types of patterns, pattern materials, and pattern allowances. Mould making - type of moulding sands, moulding sand properties, methods of sand testing, moulding machines – types of moulding machines. Core making - Core sands, Types of cores, Core prints, Chaplets, Chills, Risers and Gating systems used in casting.

UNIT-2

SPECIAL CASTING PROCESSES: Shell Moulding, Precision Investment Casting, Permanent Moulding Casting, Die Casting, Vacuum Die Casting, Low Pressure Die Casting, Centrifugal Casting, Continuous Casting, Squeeze Casting. Melting of metals in casting- Cupola furnace, Casting Cleaning Casting Defects - Causes and Remedies.

UNIT-3

WELDING PROCESSES: Classification of welding processes, types of welded joints and their characteristics, Gas welding, Different types of flames and uses, Oxy – Acetylene Gas cutting. Basic principles of Arc welding, Manual metal arc welding, submerged arc welding, and Inert Gas welding- TIG & MIG welding. Resistance welding, Solid state welding processes- Friction welding, Friction stir welding, Forge welding, Explosive welding; Thermit welding, Plasma welding, Laser welding, electron beam welding, Soldering & Brazing. Welding Defects – Causes and Remedies.

UNIT-4

METAL FORMING PROCESSES: Plastic deformation in metals and alloys, Hot working and Cold working, Strain hardening and Annealing.

Bulk forming processes: Forging - Types Forging, Smith forging, Drop Forging, Roll forging, Forging hammers, Rotary forging, forging defects; Rolling – fundamentals, types of rolling mills. Extrusion and its characteristics. Types of extrusion, Impact extrusion, Hydrostatic extrusion; Wire drawing and Tube drawing.

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UNIT-5

SHEET METAL FORMING: Shearing operations- Punching, Blanking and piercing- Bending and forming- Drawing and its types- wire drawing and tube drawing- coining- Hot and cold spinning- Types of presses and press tools.

UNIT-6

PROCESSING OF PLASTICS: Types of Plastics, Properties, Applications and Plastic processing methods – Compression moulding, Transfer moulding, Injection moulding, Blow moulding, Rotomoulding, Extrusion, Thermoforming, Calendaring and Casting.

TEXT BOOK:

1) P N. Rao, "Manufacturing Technology", Vol-I, 4th Edition, Tata McGraw-Hill Publishing Limited,
2) P. Ghosh, A., and Malik, A. K., "Manufacturing Science, Affiliated East west Press Pvt. Ltd.2010
3) S. Kalpakjian, Manufacturing Processes for Engineering Materials, Fifth edition. Pearson Education, 2009

REFERENCE BOOKS:

1) P.C. Sharma, "A text book of production technology", S. Chand and Company, 2014
2) Begman, „Manufacturing Process", John Wilely & Sons,2011
3) Production Technology by K.L. Narayana, J.K. International Publications.3rd Edition,2014
4) Rajput R.K, "A text book of Manufacturing Technology", Lakshmi Publications, 2015
5) Hajra Choudhury, "Elements of Workshop Technology, Vol. I and II", Media Promoters Pvt. Ltd.Mumbai, 2020
6) Production Technology by R.K Jain, 6th edition, 2020.

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II B.Tech, I-Sem (ME)

L	T	C
2	1	3

FLUID MECHANICS & HYDRAULIC MACHINARY

(Common to EEE & ME)

COURSE OBJECTIVES:

1. To give insight knowledge on fluid statics and fluid dynamics
2. To teach different types of fluid flow, and boundary layer phenomena
3. To teach operation and working principles of Turbo machinery, pumps and Turbines.

COURSE OUTCOMES:

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

CO1: Understand the fluid mechanics fundamentals and measure the fluid pressure using suitable measuring device.

CO2: Identify the type of flow and solve fluid flow problems

CO3: Evaluate the major and minor losses in pipes

CO4: Analyze the boundary layer flow.

CO5: Determine the impact force, work done and efficiency for different types of vanes.

CO6: Select, design and analyze the different types of turbines with reference to hydro power plants and also understand the working principle of hydraulic pumps.

	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	2	1	2	2	3	1	1	1	1	1
CO 2	2	2	1	1	2	3	1	1	1	2	1	1
CO 3	2	1	2	2	2	1	1	1	2	2	1	1
CO 4	3	1	2	1	1	1	2	1	1	1	1	1
CO 5	3	2	2	1	1	2	1	1	2	1	1	1
CO 6	2	1	1	2	2	2	1	1	2	1	1	1

UNIT I: Fluid Statics: Dimensions and units: fluid properties, mass density, weight density, specific gravity, viscosity, vapor pressure and their influence on fluid motion- atmospheric pressure, gauge pressure and vacuum pressure –measurement of pressure- Piezometer, U-tube and differential manometers.

UNIT II: Fluid Kinematics: classification of flows-steady & unsteady, uniform, non-uniform, laminar, turbulent, rotational, and irrotational flows-equation of continuity for one dimensional flow. Fluid dynamics: -Bernoulli's equation for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT III : Closed conduit flow: Laminar and turbulent flow through pipes: Reynolds experiment significance of Reynolds's number, Darcy Weisbach equation, chezy"s formula, friction factor - Minor losses in pipes- pipes in series and pipes in parallel- Measurement of flow: Pitot tube(Derivation Only),

UNIT-IV: Boundary Layer Flow: Introduction, Definitions, Drag force on a flat plate due to Boundary layer, Analysis of Turbulent Boundary layer, Separation of Boundary layer.

UNIT V: Basics of Hydraulic Machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency.

UNIT VI: Hydraulic Turbines : Classification of turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design –draft tube theory-Unit and specific quantities ,Hydraulic Pumps: Working principle of Centrifugal and Reciprocating pump. (No-derivations and No Problems)

TEXT BOOKS

1. Fluid Mechanics and Hydraulic Machinery MODI and SETH, S.Chand & co, New De
   echanics and Hydraulic Machines by R.K. Bansal, Standard Book House, Ne

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REFERENCES:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by Jagadeesh lal.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.
4. Fluid Mechanics and Hydraulic Machines by R. K. Rajput, Lakshmi Publications.
5. Instrumentation for Engineering Measurements by James W. Dally, William E. Riley, John Wiley & Sons
Inc. (Chapter 12 – Fluid Flow Measurements).

WEBSITES:

1) https://nptel.ac.in/courses/112/105/112105269/
2) https://nptel.ac.in/courses/112/105/112105171/
3) https://nptel.ac.in/courses/112/105/112105206/
4) https://nptel.ac.in/courses/112/105/112105183/
5) https://nptel.ac.in/courses/112/106/112106200/

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1	2	0.5

DESIGN THINKING

(Skill Development Course)

(Common to CE, Mech, EEE, ECE & CSE)

COURSE PRE-REQUISITES: None

COURSE OBJECTIVES:

- To create awareness of design thinking among students of engineering
- To teach a systematic approach to identifying and defining a problem before brainstorming for a solution
- To instil a sense of significance towards applying creativity to product and service design
- To motivate students to apply design thinking while implementing a project focusing on local or global societal problems

COURSE OUTCOMES: After completion of this course, the student will be able to

CO-1: Identify design principles from an engineering perspective

CO-2: Cultivate sensitivity towards design aspects of Activities, Environments, Interactions, Objects and Users (A-E-I-O-U) in daily life

CO-3: Validate problem statements through user empathisation with societal and Environmental consciousness

CO-4: Devise visual design and documentation to communicate more effectively

CO-5: Develop project management skills in a multidisciplinary environment

STUDENTS' RESPONSIBILITIES:

1. Forming diverse teams of 3–5 members each to work collaboratively throughout the semester.
2. Proactively engaging to observe the objects and interactions in their daily life and society from a design perspective.
3. Identifying general societal and social problems that may be effectively addressed using design thinking principles
4. Presenting and reporting the tasks to the concerned faculty members using their creative communication and people skills.

Unit – I

Introduction, *what is design thinking*, the traditional model of innovation, The model of design thinking, Design thinking is not old, Design thinking is to innovation, The sweet spot of design thinking.

Why design thinking now?: Products & Services, Multifaceted problems, fast becoming B2C, wide spread digitization, Customer knowledgeable, Clash of business models, Challenging markets.

Unit – II

Key tenets of Design thinking, Human centric, Focus on subject not object, Problem solving with the customer not for the customer, Thinking beyond products, Striking balance, Think Broad, Solution Generation, validation, root causes, What else, visualize your thinking, Fail often.

Inspire: Create a stretch, Get the design brief right, Adopt the power of metaphors, Widen the aperture, Bring on diversity, The learning personas, the organizing personas, the building personas,.

Unit - III

Empathize and Define: The traditional market research is broken, Create new channels to listen to customers, Be the customer you wish to serve, Leverage technology, Get to the customers, Do not limit empathy to customers, Engineering empathy, Mind mapping, Stake holder map, Customer journey map, Empathy map, Picking problem worth solving, Framing problem sharply [illegible] customer.

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Unit - IV

Ideate: Ideas are like Lego blocks, Hybrid brain storming, Intersection of disciplines, Imitate with grace, Braking the pattern, Challenging assumptions, Value chain, Looking beyond current users, Designing for extreme, Analogous design, Triggering ideation.

Prototype and Test: The high cost of just doing it, seeking clarity, Be quick and dirty, Manageable hypotheses, Doing last experiment first, Visualize through storyboarding and scenarios, Engaging through stories, Is dogfooding enough?, Solicit feedback, Inventory prototypes.

Unit - V

Scale: Keep the main thing as the main thing, cut some slack, Leaders must show up, Provide 'air cover', cultivate innovation evangelists, Measure for impact, Don't confuse empathy with good business sense.

Design Thinking in action: A two day Design thinking workshop, session objectives, Ground rules, workshop flow, mentoring programme, Build your own version of design thinking programme, offer avenues to practice design thinking, think beyond, Juggad, pay attention to the physical space, trust the process

Unit - VI

How to be a Design Thinker Live curious, Listen with intent, observe with purpose, Defer your judgement, Hone multiple affiliations, Be a T-shaped person, develop failure tolerance.

Case studies of Design thinking like Chota Cool, Indian post box, Big Bazar, Reliance, royal Enfield etc. (Any other case studies may also be considered).

Text Books:

1. Pavan Soni, Design your thinking, Penguin Random house India, 2020.
2. Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", John Wiley & Sons (2012) (ISBN: 978-1118083468)
3. Jeanne Liedtka and Tim Ogilvie , Designing for Growth: A Design Thinking Tool Kit for Managers, Columbia Business School Publishing, E-ISBN 978-0-231-52796-5
4. B. K. Chakravarthy, Janaki Krishnamoorthi, Innovation By Design: Lessons from Post Box Design & Development, Springer India, 2013
5. Donald A. Norman, "The Design of Everyday Things", MIT Press, 2013 (ISBN: 978-0262525671)
6. Tom Kelly, Jonathan Littman, "The Art of Innovation", HarperCollins Business, 2002 (ISBN: 978-0007102938)

R G M COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, I-Sem (ME) | P 3 | C 1.5

MATERIALS SCIENCE & MECHANICS OF SOLIDS LAB

OBJECTIVES:

1. To develop capability to of mount the specimen on the matrix material and able to identify the given metal by observing the micro structure
2. To Distinguish the Ferrous and non-Ferrous structures
3. To study the effect of heat treatment on microstructures
4. To understand the some fundamental aspects and failure modes of engineering materials with the applications of sudden and gradually applied loads.
5. To find out the hardness of the various materials with the help of Brinell"s & Rockwell hardness testing machines.
6. To conduct the tests for elastic constants using flexural and torsional apparatus.

OUTCOMES:

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

1. Gains the knowledge of preparing the sample for metallurgical observations
2. Identify the material based on its micro structure and also assess its mechanical properties
3. Realize the effect of heat treatment on the mechanical properties of the material.
4. Determine the Elastic constants and strength of the given material using Tension compression, torsion & Deflection tests.
5. Determine the strain energy stored in the material under impact loads
6. Determine the hardness of the given material

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2	1	2	1	1	3	1	2	-	1	1	2	1
CO2	3	1	1	1	-	1	1	1	3	1	-	-	1	1	2	1
CO3	3	3	2	2	1	2	1	1	3	1	2	-	2	1	2	1
CO4	3	3	2	2	1	2	1	1	1	1	1	1	1	2	1	1
CO5	3	3	2	2	-	2	1	1	1	1	1	1	1	1	1	1
CO6	3	3	2	2	-	1	1	1	1	1	1	1	1	1	1	1

LIST OF EXPERIMENTS:

Note: Conduct any FIVE experiments form each cycle.

Cycle-I: Materials Science Lab

1. Specimen preparation and study of the Microstructure of Low carbon steel, Medium carbon steels and high carbon steels.
2. Study of the Micro Structures of Cast Irons.
3. Study of Micro Structure of Austenitic- stainless steel and High speed steel.
4. Study of the Micro Structures of Non-Ferrous alloys (Al-alloy, Cu-alloy)
5. Determination of hardenability of steels by Jominy End Quench Test.
6. Magna Flux testing method.

Cycle-II: Mechanics of Solids Lab

1. Determination of stress-strain characteristics of Mild steel rod using Universal Testing Machine.
2. Torsion test on mild steel rod.
3. Determination of Impact strength of the metals.
4. Hardness test on metals – using Brinnel & Rockwell hardness testing machine.
5. Determination of modulus of Elasticity and flexural rigidity of beams.
6. Determination of modulus of rigidity of helical springs.

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DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, I-Sem (ME)

P	C
3	1.5

() MANUFACTURING PROCESS LAB

COURSE OBJECTIVES:

- The student should understand the some fundamental aspects and design concepts of manufacturing, pattern and pattern makings for the casting process.
- To determine the sand Viz., strengths and permeability of a sand materials and moisture percentages of green sand.
- To teach techniques adopted in welding processes like arc, gas, spot, plasma and brazing processes and also deep drawing process for making a small size parts with the help of blanking, piercing operations.
- To extrusion operations, bending and processing of plastics like injection moulding and blow moulding.
- The student should be prepared to continue the study and analysis of the production machine parts.

COURSE OUTCOMES:

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

- Imparting intensive and extensive practical knowledge of the lab so that students can understand the importance of machines.
- Enriching the student's knowledge towards production of machines elements
- Developing theoretical/practical capabilities of students so that they can characterize, transform, use and apply in engineering from the knowledge gained in solving related engineering problems.

MAPPING OF POs & COs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	-	-	-	-	-	-	3	1	-	-	1	-	-	-
CO2	1	3	-	-	-	-	-	-	3	1	-	-	3	-	-	1
CO3	1	3	-	-	-	-	-	-	3	1	-	-	2	1	-	1

I. METAL CASTING LAB:

1) Pattern Design and Making : 1 Exercise - for one casting
2) Sand Properties Testing : 2 Exercises - Strength and Permeability
3) Casting : 1 Exercise

II. WELDING LAB:

1) Arc Welding : 3 Exercises (Lap joint, Butt Joint & T- Joint)
2) Spot welding : 1 Exercises
3) Soldering of thin sheets : 1 Exercises
4) Plasma Welding and Brazing : 2 Exercises (Water Plasma Device)

III. MECHANICAL PRESS WORKING:

1) Hydraulic Press: Deep Drawing : 1 Exercise
2) Pipe Bending : 1 Exercise

IV. PROCESSING OF PLASTICS:

1) Injection Moulding : 1 Exercise
2) Blow Moulding : 1 Exercise

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II B.Tech, I-Sem (ME) P C
3 1.5

FLUID MECHANICS & HYDRAULIC MACHINARY LAB

(Common to EEE & ME)

COURSE OBJECTIVES:

This course "Fluid Mechanics and Hydraulic Machines" lab imparts intensive and extensive practical knowledge of the lab so that students can understand the importance of concepts of "Fluid Mechanics and Hydraulic Machines" in the field of engineering. The student should able to develop theoretical / practical capabilities so that they can characterize, transform, use and apply in engineering from the knowledge gained in solving related engineering problem.

COURSE OUTCOMES:

In order to assess the students progress towards achieving the learning outcomes,

CO1:.Enable the students to use knowledge of Fluid mechanics and hydraulic machines for practical applications.

CO2: Develops the ability for running hydraulic machines lab.

CO3: Students are able to understand the working function of various devices used in hydraulic power plant.

CO4: Students can understand the principle of Bernoulli's theorem.

CO5: Understand the concept of impact of jets.

CO6: Student can understand how to determine friction of various pipe material.

	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1	3	2	3	2	1	2	2	2	1	1	1	1
CO 2	2	2	1	1	2	3	1	1	1	1	2	1
CO 3	3	2	2	2	2	2	2	2	2	2	1	2
CO 4	3	1	1	1	1	1	2	1	1	1	1	1
CO 5	2	1	2	3	1	2	1	1	1	1	1	1
CO 6	3	2	1	2	1	1	2	2	1	1	2	1

LIST OF EXPERIMENTS:

1. Verification of Bernoulli's Equation
2. Calibration of mouth piece/orifice
3. Calibration of Triangular Notch/Rectangular Notch
4. Calibration of Venturi meter
5. Calibration of Orifice meter
6. Determination of Friction Factor for a given pipe line
7. Impact of Jet on Vanes
8. Performance Test on Pelton Wheel
9. Performance Test on Francis Turbine
10. Performance Test on Kaplan Turbine
11. Performance Test on Single Stage Centrifugal Pump
12. Performance Test on Reciprocating Pump

Note: Conduct Any Ten FROM ABOVE Experiments

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DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, I-Sem (ME)

L	T	C
1	2	0.5

() APTITUDE ARITHMETIC REASONING AND COMPREHENSION

(For branches CE, EEE, Mech, ECE & CSE)

COURSE OBJECTIVES:

- To familiarize the students about the concepts of aptitude, arithmetic and reasoning
- To cope up the students to improve their employable skills

COURSE OUTCOMES:

After completion of the course the student will be able to:

- Understand number system which helps to become well trained for recruitment drives.
- Analyze permutations and combinations concept.
- Obtain the knowledge of coding and decoding concept.
- Understand the topics related to clock and probability.
- Identify the topics related to Venn diagrams, reasoning and Non-verbal reasoning.

MAPPING OF COs & POs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-
CO4	3	2	3	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-

UNIT-1

Numbers, Number Systems Simple Equations, Ratio, Proportion, Variation Quadratic Equations, Progressions Percentages.

UNIT-2

Profit, Loss, Partnerships Averages, Mixtures & Allegations, Simple Interest, Compound Interest, Time and Work-Pipes, indices, surds, inequalities , Cisterns Time and Distance Geometry and Menstruation.

UNIT-3

Permutations & Combinations and Probability Data Interpretation & Data Sufficiency.

UNIT-4

Number & Letter Series, Analogies, Coding Decoding, Odd Man Out Blood Relations.

UNIT-5

Direction Sense, Symbols and Notations Deductions & Connectives Clocks, Calendars Analytical

UNIT-6

Reasoning (Verbal and Non-Verbal) , Venn Diagrams, Analytical Puzzles and Octal number system.

REFERENCES:

1) R.S.Agarwal. Quantitative Techniques. S.Chand Series.
2) Shankuntala Devi. Techniques of Reasoning. S.Chand Series.
3) https://www.fresherslive.com/online-test/verbal-ability-test/questions-and- answers
4) https://www.fresherslive.com/online-questions/verbal-ability-test/arithmetic-Reasoning

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DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, II-Sem (ME)

L	T	C
2	1	3

() BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(For branches CE & Mech)

OBJECTIVE:

- This course introduces the basic concepts in electric circuits and networks
- This course also introduces the working principles of D.C Generator, DC motor.
- It also helps to study the operating principles of Transformers and their working.
- To understand the fundamental principles of basic electronic devices.
- To provide theoretical prerequisites necessary to do lab work on DC machines and Electronic Devices.

OUTCOMES:

At the end of the course student is able to

- Know the basic knowledge of conducting materials and electrical circuit parameters.
- Understand the principles of dc machines.
- Analyze the working operation of Transformer.
- Determine the efficiency of machines, half wave and full wave rectifiers.
- Observe the different tests and calculations of all machines.
- Applications of dc machines, transformers and rectifiers.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	2	-	1	2
CO2	3	3	1	2	-	-	-	-	2	-	1	2
CO3	3	1	2	3	-	-	-	-	1	-	2	1
CO4	3	3	2	2	-	-	-	-	2	-	2	2
CO5	3	3	1	2	-	-	-	-	1	-	2	2
CO6	3	1	3	2	-	-	-	-	2	-	1	1
Avg.	3	3	2	2	-	-	-	-	2	-	2	2

UNIT – I

ELECTRICAL DC CIRCUITS: Basic definitions (electrical conductor, insulator, semiconductor, electrical circuit, electric current, electric potential, EMF and electric potential difference) - Types of elements(active and passive elements)- Ohm's Law and its limitations- electric power-electrical energy- Kirchhoff's Laws- Resistances in series- Resistances in parallel- Star to delta and delta to star transformations- simple problems.

UNIT – II

DC-GENERATOR: CONSTRUCTION AND OPERATION**:** D.C Generators**-**Working Principle – construction of DC Generator - Action of commutator, types of armature windings, induced emf equation, – Classification of DC Generators-separately excited, self-excited- series, shunt, short & long shunt compound generator-simple problems regarding EMF.

UNIT – III

DC MOTOR: DC motors-principle of operation -back emf –voltage and power equation of dc motor, condition for maximum power -types of DC Motors- series, shunt, short & long shunt compound motor, torque & speed equation –speed control of DC Shunt Motor –armature control method, field control method-losses in DC machines- efficiency calculation –simple problems on types and torque equation.

UNIT – IV

TRANSFORMERS: Necessity of transformer-classification of transformers-Principle of operation of single phase transformers- Theory of an Ideal Transformer –Constructional features – core type & shell type transformers, induced emf equation, transformation ratio's-losses in a transformer-efficiency of transformer-transformer on no-load & R-load –simple problems.

UNIT – V

DIODE AND ITS CHARACTERISTICS: Formation of n- type and p-type semiconductor – Construction of P-N junction diode, symbol - V-I Characteristics- Diode Applications-Rectifiers – Half wave-Full wave-mid-point only-simple Problems.

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UNIT - VI

TRANSISTORS and CRO: Formation of PNP and NPN transistors – CE configuration of NPN and PNP transistors- applications -Transistor as an amplifier- construction and Principle of CRO(operation only)-Applications.

TEXT BOOKS:

1. Electrical and Electronic Technology – 10th Edition – Edward Hughes, Pearson Publications
2. Engineering Circuit Analysis – 8th Edition – W.Hayt & J.E.Kemmerly, Mc Graw Hill Publications
3. Basic Electrical Engineering – 2nd Edition – Kothari & Nagrath, TMH Publications
4. Principles of Electrical & Electronics Engineering – 1st Edition – V.K.Mehta, S.Chand Publications

REFERENCES:

1. Introduction to Electrical Engineering – 3rd Edition – M.SNaidu & S.Kamakshaiah, TMH Publ.
2. Electrical Circuit Analysis – 3rd Edition – Sudhakar & Shyam Mohan, TMH Publications
3. A Text Book of Electrical Technology–8th Edition- B.L.Theraja & A.K.Theraja, S.Chand Publications

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DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, II-Sem (M.E)

L	T	C
2	1	3

PYTHON PROGRAMMING

COURSE OBJECTIVES: This course will enable students to:

1. Learn Syntax and Semantics of various Operators used in Python.
2. Understand about Various Input, Output and Control flow statements of Python.
3. Understand Strings, List, Tuple, Set and Dictionary in Python.
4. Implement Object Oriented Programming concepts in Python.
5. Understand Exception handling and File I/O in Python.
6. Understand Functions, Modules and Regular Expressions in Python.

COURSE OUTCOMES: The students should be able to:

1. Examine Python syntax and semantics and be fluent in the use of various Operators of Python.
2. Make use of Flow Control statements, Input / Output functions and Strings of Python.
3. Demonstrate proficiency in handling of data structures like List, Tuple, Set and Dictionary.
4. Demonstrate the use of Functions, Modules and File I/O operations in in Python.
5. Interpret the Concepts of Object-Oriented Programming in Python.
6. Interpret the various issues of Exception handling mechanisms and Regular Expressions in Python.

MAPPING OF COs & POs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1			2				1	1		1	1	1	
CO2	3	2	1		2				1	1		1	1	1	
CO3	3	3	2	1	2				1	1		2	1	2	2
CO4	3	2	1	1	2				1	1		1	1	1	1
CO5	3	3	2	1	2	1			1	1		2	2	2	2
CO6	3	3	2	1	2	2			1	1		2	2	2	2

UNIT – I:

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. Overview on Fundamental data types of Python.

Operators in Python: Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Shift Operators, Ternary operator, Membership Operators, Identity Operators, Expressions and order of evaluations. Illustrative examples on all the above operators.

UNIT – II:

Input and Output statements: input() function, reading multiple values from the keyboard in a single line, print() function, 'sep' and 'end' attributes, Printing formatted string, replacement operator ({}). **Control flow statements:** Conditional statements. Iterative statements. Transfer statements.

Strings: Operations on string, String slicing, important methods used on string.

UNIT – III:

Lists: Operations on List, important methods used on list. List comprehensions

Tuples: Operations on tuples, important methods used on tuple.

Sets: Operations on sets, important methods used on set.

Dictionaries: Operations on Dictionaries, important methods used on dictionaries.

UNIT – IV:

Functions - Defining Functions, Calling Functions, Types of Arguments - Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful functions, Scope of the Variables in a Function. Recursive functions.

Modules: Creating modules, import statement, from Import statement.

File I/O: Need of files concept, Types of file Opening and Closing a Text file, Rea operations on files, Setting offsets in a file, Traversing a Text file.

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UNIT – V:

Object Oriented Programming (OOP) in Python: Classes and Objects, 'self-variable', Types of Variables and Methods used in Classes, Constructor Method, Inheritance, Overriding Methods, Abstract Classes, Data hiding.

UNIT – VI:

Error and Exceptions: Difference between an Error and Exception, Types of Exceptions, Handling Exceptions, try, except, else and finally blocks, control flow in try-except-else-finally blocks, Raising Exceptions, Customized Exceptions.

Regular Expressions: Character matching in regular expressions, Extracting data using regular expressions.

TEXT BOOKS

1. Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.
2. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018**.**

REFERENCE BOOKS

1) R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019Core Python Programming, 2016 W.Chun, Pearson.
2) Introduction to Python, 2015 Kenneth A. Lambert, Cengages
3) https://www.w3schools.com/python/python_reference.asp
4) https://www.python.org/doc/

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R G M COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, II-Sem (M.E)

L	T	C
2	1	3

[] KINEMATICS OF MACHINERY

OBJECTIVES:

- To study about terms used in kinematics of machinery.
- To learn how to analyze the motions of link mechanisms and to analyze forces in machines.
- To analyze the motions of Cam and follower assembly.
- To locate the instantaneous centre for the given planer mechanism.
- To determine the velocity and accelerations of the linkages in a planer mechanism.
- To study about the toothed gears and related terminology.

OUTCOMES:

Upon successful completion of this course, the student will be able to:

1. Identify the basic relations between distance, time, velocity, and acceleration.
2. Distinguish the basics of kinematics and kinetics of motion.
3. Develop familiarity with application of kinematics theories to real-world machines.
4. Understand analytical linkage analysis, cam profiles, and gear trains.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	3	-	2	-	2	-	1	-	-	-
CO2	3	2	2	2	-	-	2	-	2	-	-	-	1	-	-	-
CO3	3	2	2	-	2	-	-	-	-	-	2	-	2	1	-	-
CO4	3	2	3	2	2	-	-	-	-	-	2	-	2	-	-	-

UNIT – I

MECHANISMS : Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained .

MACHINES : Mechanism and machines – classification of machines – kinematic chain – inversion of mechanism – inversions of quadric cycle, chain – single and double slider crank chains.

UNIT - II

KINEMATICS: Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration diagrams – Graphical method – Application of relative velocity method four bar chain.

Analysis of Mechanisms: Analysis of slider crank chain for displacement, velocity and acceleration of slider – Acceleration diagram for a given mechanism, Klein's construction.

UNIT-III

PLANE MOTION OF BODY: Instantaneous center of rotation, centroids and axodes – relative motion between two bodies – Three centres in line theorem – Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

Straight Line Motion Mechanisms: Exact and approximate copiers and generated types – Peaucellier, Hart and Scott-Rassul – Grasshopper – Watt T. Chebi-cheff and Robert Mechanisms and straight line motion, Pantograph.

UNIT – IV

CAMS: Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion - Uniform velocity – Simple harmonic motion and uniform acceleration. Maximum velocity and maximum acceleration during outward and return strokes in the above three cases.

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UNIT – V

TOOTHED GEARING: Higher pairs, friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion, Form of teeth: cycloidal and involute profiles. Velocity of sliding – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact.

UNIT – VI

GEAR TRAINS: Introduction – Train value – Types – Simple and reverted wheel train – Epicyclic gear Train. Methods of finding train value or velocity ratio – Epicyclic gear trains.

TEXT BOOKS:

1. Theory of Machines and Mechanisms-S.S.Rattan, Tata McGraw Hill Publishers
2. Theory of Machines by Thomas Bevan/ CBS.

REFERENCE BOOKS:

1. Theory of Machines / R.K Bansal, Lakshmi Publications.
2. Theory of machines by Jagadishlal.
3. Theory of Machines R.S Khurmi & J.K Gupta.
4. Mechanism and Machine Theory / JS Rao and RV Dukkipati / New Age
5. The theory of Machines /Shiegley/ Oxford.
6. Theory of machines – PL. Balaney/khanna publishers

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II B.Tech, II-Sem (ME)

L	T	C
2	1	3

() APPLIED THERMODYNAMICS

(Note: Steam Tables and Mollier Chart are permitted in the examinations)

COURSE OBJECTIVES:

- To learn about IC engines and , theory of combustion
- To learn about vapor cycles and their first law and second law efficiencies
- To learn about gas dynamics of steam through nozzles
- To learn the about reciprocating compressors with and without inter cooling

COURSE OUTCOMES:

- They will be able to understand the IC engines and, theory of combustion
- They will be able to Conduct the performance test and estimating the performance of an I.C Engines
- The students will get a good understanding of vapor power cycles.
- They will be able to analyze energy conversion in various thermal devices such as, nozzles, and reciprocating compressors

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	3	2	2	-	1	-	-	2	-	1	2	2	-	2	1
CO2	3	3	3	3	3	2	1	-	2	2	2	2	2	-	2	1
CO3	1	3	3	3	3	2	1	-	2	2	1	2	2	-	2	1
CO4	1	3	2	2	-	1	-	-	2	-	1	-	2	-	-	1

UNIT-1

Air Standard Cycles: Air Standard Otto Cycle, Diesel Cycle, Thermal Efficiency, Comparison of Otto and Diesel. Simple problems on Otto & diesel cycles.

Introduction to IC Engines: Energy conversion, Classification of I.C. Engines, Working principle of two stroke and four stroke engines & application of I.C Engines.

UNIT-2

Combustion in I.C Engines: Stages of combustion in SI & CI Engines - Importance of flame speed and factors influencing the flame speed in SI engines- Importance of ignition delay period and factors affecting the ignition delay period in CI Engines- Abnormal Combustion - pre-ignition- Phenomenon of Knocking SI & CI, Summary of Engine variables affecting the knocking, Comparison of knock in SI & CI Engines.

UNIT-3

Testing and Performance: Engine Performance Parameters - Emissions from Diesel & Petrol Engines, BS-Norms - Simple problems on performance and heat balance sheet.

UNIT-4

Vapor power cycles: Rankine cycle with superheating, reheating and regeneration. Supercritical and ultra super-critical Rankine cycle. Combined gas and vapor power cycles. Simple problems on Rankine Cycle.

UNIT-5

Steam Nozzles: Introduction - types, Steam flow through nozzles- condition for maximum discharge (critical pressure ratio), Nozzle efficiency - Simple problems.

Air Compressors: Introduction, Classification **-** Reciprocating compressors, optimal pressure ratio, effect of inter cooling, minimum work for multistage reciprocating compressors- Introduction to rotary compressors.

UNIT-6

Refrigeration & Air Conditioning: Working principle of vapor compression & Vapor Absorption refrigeration system, – summer and winter air conditioning system.

TEXT BOOKS:

1) Thermal Engineering, R.K. Rajput, 7/e, Lakshmi Publications, 2009.
2) Thermal Engineering, R.S Khurmi & JS Gupta, S.Chand.
modynamics and Heat Engines, R.Yadav, Central Book Depot.

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REFERENCES:

1) Fundamentals of Thermodynamics, . Sonntag, R. E, Borgnakke, C. and Van Wylen.
2) Thermal Engineering - M.L.Mathur & Mehta, Jain bros.
3) 3., Fundamentals of Engineering Thermodynamics, Moran, M. J. and Shapiro.

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DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, II-Sem (ME)

L	T	C
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INDUSTRIAL MANAGEMENT & ACCOUNTANCY

OBJECTIVES:

1. To impart knowledge on work study techniques towards productivity improvement industrial engineering concepts towards manufacturing management quality engineering and reliability tools.
2. To impart knowledge on the material management.
3. This course will introduce various concepts and methods of economic analysis in engineering, including the time value of the money and its effect on economic decisions, economic equivalence, cash flow analysis and cost accounting.

COURSE OUTCOMES:

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

CO1: Understand where the plant is to be located based on facilities available and plant layout and also plant layout design to facilitate material flow and processing of a product in the most efficient manner through the shortest possible time.

CO2: Apply various work study techniques towards productivity improvement apply in IE&M concepts in real life environment for goal achievement.

CO3: Understand the importance and function of inventory and apply selected techniques for its control and management under dependent and independent demand circumstances, importance of Inventory control to ensure their availability with minimum capital lock up.

CO4: Apply the basic principles of group dynamics and associated concepts required for HRM in organizations. Design a simple sampling plan, construct its OC curve and evaluate its effectiveness on a given sampling process.

CO5: Perform analysis of financial statements and inputs therein will help them to make sound and effective decisions under different economic environment and market situations.

CO6: Perform financial accounting and its analysis.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	-	-	3	3	2	2	-	-	-	-	-	-	1	1	-	1
CO3	-	-	-	-	-	1	3	3	-	-	2	2	2	-	-	2
CO4	3	-	-	3	2	-	-	-	-	-	2	-	2	-	-	1
CO5	3	2	1	-	-	-	-	-	-	-	-	-	1	-	-	-
CO6	-	-	-	2	-	3	-	2	1	-	1	2	1	2	-	1

UNIT-I

INTRODUCTION: Introduction to Management, Concept of Industrial Management, Functions of Management.

PLANT LOCATION & LAYOUT: Introduction, factors affecting the plant location, comparison of rural and urban sites- methods for selection of plant. Types of production systems; Plant Layout – objectives and types of plant layout.

UNIT-II

WORK STUDY: Introduction, objectives of work study, steps in work study, purpose of method study, procedure of method study, recording techniques. Work measurement-purpose of work measurement, time study procedure-performance rating, standard time calculations (simple problems).

UNIT-III

MATERIALS MANAGEMENT: Objectives, Inventory – functions, types, associated costs, inventory control techniques-ABC and VED analysis. Purchase management, duties of purchas

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associated forms, purchase procedure, methods of purchasing**.** Stores Management and Stores Records.

UNIT-IV

QUALITY CONTROL: Meaning, process control, SQC control charts, single, double and sequential sampling,

JOB EVALUATION AND MERIT RATING: Job Evaluation - Objectives, Methods of job evaluation. Merit Rating - Objectives and methods of merit rating.

UNIT-V

ELASTICITY OF DEMAND: Introduction, Types, measurement and significance of elasticity of Demand.

BREAK EVEN ANALYSIS (BEA) - Determination of breakeven point (simple problems) - managerial significance and limitations of BEA.

BUSINESS AND NEW ECONOMIC POLICY: Characteristics of business, features and evaluation of forms of business organization based on ownership, Nature of the economy, structure of the economy, economic policies, new economic policy 1991, economic conditions.

UNIT-VI

Accountancy: Accounting principles, Procedure-Double entry system-journal-ledger, Trail balance – cash book-preparation of trading, profit and loss Account-Balance sheet.

TEXT BOOKS:

1. Dr. Ravi Shankar: Industrial Engineering and management/Galgotia publications pvt. Ltd.
2. Khanna O.P.: Industrial Engineering.
3. Agarwal AN, "Indian Economy "Wiley Eastern Ltd, New Delhi
4. Jain and Narang "Accounting part-1" Kalyani publishers
5. Arora, M.N." Cost Accounting", Vikas publications

REFERENCE BOOKS:

1. Industrial engineering and operations management by S.K. Sharma and Savita Sharma.
2. T.R. Banga: Industrial Engineering and Management
3. M. Mahajan: Industrial engineering and production management, Dhanpat Rai & Co.
4. Ashwatappa. K "Business Environment"
5. Aryasri "Managerial Economics and Financial Accounting"

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DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, II-Sem (ME) P C

3 2

() BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB
(Common to ME & CE)

OBJECTIVE:

- To experiment and verify the basic electrical and electronic principles.
- To provide practical exposure to test the performance of DC machines.
- It helps to study the characteristics of basic electronics devices

OUTCOMES:

At the end of the course student is able to

- To know the basic knowledge of electrical circuit parameters and Kirchhoff's laws.
- Understand the principles of dc machines and transformers.
- Analyze the working operations of measuring instruments, electrical machines.
- Determine the efficiency of machines, half wave and full wave rectifiers.
- Able to observe the different tests and calculations of all machines.
- Applications of dc machines, instruments and rectifiers.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		-	-	2	-	-	-	3	-	-	-
CO2	3	1	2	-	2	-	-	-	3	-	-	-
CO3	3	3	2	2	1	2	-	-	3	-	2	-
CO4	3	1	1	1	-	1	-	-	3	-	-	-
CO5	3	2	1	2	-	2	-	-	3	-	2	-
CO6	3	2	1	1	2	1	-	-	2	1	-	-
Avg.	3	2	2	2	2	2	-	-	3	1	2	-

Section – A

Electrical Engineering Lab: **(Any five experiments)**

1. Verification of Kirchhoff's laws
2. Verification of Resistors in Series and Parallel
3. Verification of Ohm's law
4. Speed control of D.C. Shunt motor by Armature Voltage control
5. Speed control of D.C. Shunt motor by Field flux control method
6. Brake test on D.C Shunt Motor

Section – B

Electronics Engineering Lab: (Any five experiments)

1. PN-Junction diode characteristics
2. Half-wave Rectifier without filters
3. Full-wave center tapped without filters
4. Transistor Common Emitter Characteristics (Input and Output)
5. Common Emitter Amplifier
6. Study of CRO (Voltage and time measurements)

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DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, I-Sem (ME)

P C
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PYTHON PROGRAMMING LAB

(Common to all Branches)

COURSE OBJECTIVES:

- To be able to introduce core programming basics and various Operators and flow control statements of Python programming language through proper practice.
- To demonstrate about various Python fundamental data structures such as int, float, complex, bool and strings.
- To demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries.
- To demonstrate about Functions, Modules and File Input - Output operations in Python programming language.
- To demonstrate about Object Oriented Programming in Python Programming.
- To understand about and Exception handling mechanisms and Regular Expressions in Python Programming.

COURSE OUTCOMES:

- Student should be able to understand the basic concepts of scripting and the contributions of scripting language.
- Student should be able to explore Fundamental data structures in Python.
- Student should be able to explore python data structures like Lists, Tuples ,Sets and dictionaries.
- Student should be able to explore Functions, Modules and File input – Output Operations in Python programming language.
- Student should be able to explore Object Oriented Programming in Python Programming.
- Student should be able to create practical and contemporary applications using Exception handling mechanisms and Regular Expressions.

MAPPING OF COs & POs

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	1			1				1	1		1	2	1	1
CO 2	3	3	2		2				1	1		1	1	1	1
CO 3	3	2	2	1	2				1	1		2	1	2	1
CO 4	3	2	1		2				1	1		1	1	2	
CO 5	3	3	1	1	1				1	1		2	2	2	2
CO 6	3	3	1	1	1				1	1		2	2	2	2

S.NO	Name of the Experiment	Remarks
1	a) Demonstrate about Basics of Python Programming.	
	b) Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)	
	c) Demonstrate the working of following functions in Python. i) id( ) ii) type( ) iii) range( )	
	d) Write a Python program to demonstrate various base conversion functions.	
	e) Write a Python program to demonstrate various type conversion functions.	
2	a) Demonstrate the following Operators in Python with suitable examples. i) Arithmetic Operators ii) Relational Operators iii) Assignment Operator iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators	
3	a) Write Python programs to demonstrate the following: i) input( ) ii) print( ) iii) 'sep' attribute iv) 'end' attribute v) replacement Operator ({ })	
	b) Demonstrate the following Conditional statements in Python with suitable examples. i) if statement ii) if else statement iii) if – elif – else statement	

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	c) Demonstrate the following Iterative statements in Python with suitable examples. i) while loop ii) for loop	
	d) Demonstrate the following control transfer statements in Python with suitable examples. i) break ii) continue iii) pass	
4	Write Python programs to print the following Patterns:	
	i) A A B A B C A B C D A B C D E	
	ii) * * * * * * * * * * * * * * *	
	iii) E E E E E E E E E D D D D D D D C C C C C B B B A	
	iv) 4 4 3 4 3 2 4 3 2 1 4 3 2 1 0 4 3 2 1 4 3 2 4 3 4	
	v) 4 3 4 2 3 4 1 2 3 4 0 1 2 3 4 1 2 3 4 2 3 4 3 4 4	
	vi) * * ** ** *** *** **** **** **********	

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	vii) ** ** **** **** ****** ****** ********* ********* *********** ***********	
	viii) E D E C D E B C D E A B C D E B C D E C D E D E E	
5	a) Write a Python program to demonstrate various ways of accessing the string. i) By using Indexing (Both Positive and Negative) ii) By using Slice Operator	
	b) Demonstrate the following functions/methods which operates on strings in Python with suitable examples: i) len( ) ii) strip( ) iii) rstrip( ) iv) lstrip( ) v) find( ) vi) rfind( ) vii) index( ) viii) rindex() ix) count( ) x) replace( ) xi) split( ) xii) join( ) xiii) upper( ) xiv) lower( ) xv) swapcase( ) xvi) title( ) xvii) capitalize( ) xviii) startswith() xix) endswith()	
6	a) Demonstrate the different ways of creating list objects with suitable example programs.	
	b) Demonstrate the following functions/methods which operates on lists in Python with suitable examples: i) list( ) ii) split( ) iii) len( ) iv) count( ) v) index ( ) vi) append( ) vii) insert( ) viii) extend() ix) remove( ) x) pop( ) xi) reverse( ) xii) sort( ) xiii) copy( ) xiv) clear( )	
	c) Demonstrate the following with suitable example programs: i) List slicing ii) List Comprehensions	
7	a) Demonstrate the different ways of creating tuple objects with suitable example programs.	
	b) Demonstrate the following functions/methods which operates on tuples in Python with suitable examples: i) len( ) ii) count( ) iii) index( ) iv) sorted( ) v) min ( ) vi)max( ) vii) cmp( ) viii) extend() ix) remove( ) x) pop( ) xi) reverse( ) xii) sort( ) xiii) copy( ) xiv) clear( )	
8	a) Demonstrate the different ways of creating set objects with suitable example programs.	
	b) Demonstrate the following functions/methods which operates on sets in Python with suitable examples: i) add( ) ii) update( ) iii) copy( ) iv) pop( ) v) remove( ) vi)discard( ) vii) clear( ) viii) union() ix) intersection( ) x) difference( )	
9	a) Demonstrate the different ways of creating dictionary objects with suitable example programs.	
	b) Demonstrate the following functions/methods which operates on dictionary in Python with suitable examples: i) dict( ) ii) len( ) iii) clear( ) iv) get( ) pop( ) vi)popitem( ) vii) keys( ) viii) values()	

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	ix) items( ) x) copy( ) xi) update( )	
10	a) Demonstrate the following kinds of Parameters used while writing functions in Python. i) Positional Parameters ii) Default Parameters iii)Keyword Parameters iv) Variable length Parameters	
	b) Write a Python program to return multiple values at a time using a return statement.	
	c) Write a Python program to demonstrate Local and Global variables.	
	d) Demonstrate lambda functions in Python with suitable example programs.	
11	a) Python program to perform read and write operations on a file.	
	b) Python program to copy the contents of a file to another file.	
	c) Python program to count frequency of characters in a given file.	
	d) Python program to print each line of a file in reverse order.	
	e) Python program to compute the number of characters, words and lines in a file.	
12	Demonstrate various Object Oriented Programming Concepts in Python Programming with illustrative examples.	
13	Demonstrate about Exception Handling in Python Programming with illustrative examples.	
14	a) Demonstrate the following in-built functions to use Regular Expressions very easily in our applications. i) compile( ) ii) finditer( ) iii) match( ) iv) fullmatch( ) v) search( ) vi) findall( ) vii) sub( ) viii) subn( ) ix) split( )	
	b) Write a Regular Expression to represent all RGM language (Your own language) identifiers. **Rules**: 1. The allowed characters are a-z,A-Z,0-9,#. 2. The first character should be a lower case alphabet symbol from a to k. 3. The second character should be a digit divisible by 3. 4. The length of identifier should be at least 2. Write a python program to check whether the given string is RGM language identifier or not?	
	c) Write a Regular Expression to represent all 10 digit mobile numbers. **Rules:** 1. Every number should contains exactly 10 digits. 2. The first digit should be 7 or 8 or 9 Write a Python Program to check whether the given number is valid mobile number or not?	

TEXT BOOKS

1. Learning Python, Mark Lutz, Orielly, 3 Edition 2007.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson, 2017.

REFERENCE BOOKS

1) Think Python, 2 Edition, 2017 Allen Downey, Green Tea Press
2) Core Python Programming, 2016 W.Chun, Pearson.
3) Introduction to Python, 2015 Kenneth A. Lambert, Cengages
4) https://www.w3schools.com/python/python_reference.asp
5) https://www.python.org/doc/

3 1.5

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R G M COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, II-Sem (ME)

P	C
3	1.5

() THERMAL ENGINEERING LAB

COURSE OBJECTIVES:

- Imparting intensive and extensive knowledge of the Lab so that students can understand the role of Thermal Engineering in the field of Engineering.
- Developing theoretical/practical capabilities of students so that they can characterize, transform and use Thermal Engineering in Engineering and Apply knowledge gained in solving related Engineering problems.
- The student should able to know the use of various air compressors.
- The student should able to know the use of refrigeration systems.
- The student should able to know the use of air conditioning systems.

COURSE OUTCOMES:

At the end of the Lab work the student should have knowledge on/off:

- Applying the practical skills in designing and testing the thermal engineering related equipment.
- How to estimate the performance of a boiler.
- How to estimate the performance of an air compressor.
- Conducting and Estimating the performance of a refrigerator and air conditioning systems.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	-	2	2	3	2	-	3	-	1	3	2	-	-	1
CO2	3	3	-	2	2	3	2	-	3	-	1	3	1	-	-	-
CO3	3	3	-	2	2	3	2	-	3	-	1	3	-	-	-	-
CO4	3	3	-	2	2	3	2	-	3	-	1	3	2	-	-	1

LIST OF EXPERIMENTS:

(Conduct any Five from each cycle for Record)

CYCLE: I

1) Determination of Volumetric & Isothermal Efficiency of Multi Stage Reciprocating Air Compressor Test Rig.
2) Performance test on Centrifugal/axial flow air compressor test rig.
3) Determination of COP of a Vapor Compression Refrigeration Test Rig.
4) Determination of COP of a Summer/winter Air Conditioning Test Rig.
5) Determination of Calorific Value of a liquid/gaseous fuels.
6) Determination of Kinematic & Dynamic Viscosities of liquid fuels by using Redwood & Say Bolt Viscometer.
7) Determination of flash & Fire Points of Liquid Fuels by using Cleveland's & Ables apparatus.

CYCLE: II

1) Draw the Actual Valve & Port timing Timing Diagrams of a four stroke Diesel/ two stroke petrol Engines.
2) Performance Test on 4S Single Cylinder/Multi Cylinder Petrol / Diesel Engine test rigs.
3) Performance Test on VCR Computerized Multifuel Research Engine test rig.
4) Determination of Engine friction Power by Morse, retardation & Willan's line test Methods.
5) To draw the HBS/HBC on 4S Single Cylinder/Multi Cylinder Petrol / Diesel Engine test rigs.
6) To draw the HBS/HBC on VCR Computerized Multifuel Research Engine test rig.
7) Measurement of I.C Engine Exhaust Gas Emissions from Petrol/Diesel Engines.

STUDY:

ly of I.C Engine Parts.

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DEPARTMENT OF MECHANICAL ENGINEERING

II B.Tech, II-Sem (ME) | P 3 | C 2.0

APTITUDE ARITHMETIC REASONING AND COMPREHENSION
(Common to All Branches)
(Skill Development Course)

OBJECTIVES:

- To make the students ready to the recruitment drives.
- To raise the confidence of the students to face the written test of any Company.
- To train the students regarding employability skills.

OUTCOMES:

1. Knowledge on menstruation
2. Ability to solve arithmetical problem with easy
3. Knowledge on reasoning & logic
4. Knowledge on notations and numbering.
5. Build-up the confidence to face competitive examination.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	-	-	-	-	-	3	-	-	-	-	-	-	1	-	1	-
CO 2	-	-	-	2	-	-	-	-	-	-	-	-	-	1	-	-
CO 3	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-
CO 4	-	-	-	-	-	-	-	-	-	3	-	-	-	-	1	-
CO 5	-	-	-	3	-	-	-	-	-	-	-	-	-	-	2	-

UNIT I

Numbers, Number Systems Simple Equations, Ratio, Proportion, Variation Quadratic Equations, Progressions Percentages.

UNIT II

Profit, Loss, Partnerships Averages, Mixtures & Allegations, Simple Interest, Compound Interest, Time and Work-Pipes, indices, surds, inequalities ,Cisterns Time and Distance Geometry and Menstruation.

UNIT III

Permutations & Combinations and Probability Data Interpretation & Data Sufficiency.

UNIT IV

Number & Letter Series, Analogies, Coding Decoding, Odd Man Out Blood Relations.

UNIT V

Direction Sense, Symbols and Notations Deductions & Connectives Clocks, Calendars Analytical

UNIT VI

Reasoning (Distribution+ Binary Logic + Puzzles) Cubes, Venn Diagrams Analytical Puzzles (Linear + Circular +Selections + Sequencing + Routes & Networks + Comparisons) and Non Verbal Reasoning

REFERENCES:

1. R.S.Agarwal " Quantitative Techniques" S.Chand Series
2. Shankuntala Devi " Techniques of Reasoning" S.Chand Series

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