ACADEMIC REGUALTIONS, COURSE STRUCTURE AND DETAILED SYLLABUS

MECHANICAL ENGINEERING

For CBCS BASED B.TECH – FOUR YEAR PROGRAM
(Applicable for the batches admitted from AY 2016-17)

Geethanjali College of Engineering and Technology

(Autonomous)

Cheeryal (V), Keesara (M), Medchal Dist., Telangana – 501 301.

ACADEMIC REGULATIONS 2016
For CBCS Based B.Tech. PROGRAMMES

(Effective for the students admitted into I year from the Academic Year **2016-17** and onwards)

1.0 Under-Graduate Degree Programme (B.Tech.) in Engineering

Geethanjali College of Engineering and Technology (GCET) offers 4 Year (8 Semesters) **Bachelor of Technology** (B.Tech.) Degree Programme, under Choice Based Credit System (CBCS) with effect from the Academic Year 2016 - 17 onwards, in the following Branches of Engineering

S. No.	*Branch*
I.	Civil Engineering
II.	Computer Science and Engineering
III.	Electrical and Electronics Engineering
IV.	Electronics and Communication Engineering
V.	Mechanical Engineering

2.0 Eligibility for Admission

2.1 Admission to the B.Tech. Programme shall be made either on the basis of the merit rank obtained by the qualifying candidate at an Entrance Test conducted by the Telangana State Government (EAMCET), OR the JNTUH, OR on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government of Telangana from time to time.

2.2 The medium of instruction for all the B.Tech. programmes shall be ENGLISH only.

3.0 B.Tech. Programme Structure

3.1 The B.Tech. Programmes of GCET are of semester pattern, with 8 semesters constituting 4 academic years, each academic year having TWO semesters (first/odd and second/even semesters). Each semester shall be of 21 weeks duration (inclusive of examinations), with a minimum of 90 working days per semester.

3.2 UGC/ AICTE specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are as listed below.

3.2.1 Semester Scheme:

Each B.Tech. program is of 4 (Four) academic years (8 semesters), with each academic year being divided into two semesters of 21 weeks (minimum of 90 working days) each, which includes instruction period, preparation and examinations period; each semester having - '**Continuous Internal Evaluation (CIE)**' and '**Semester End Examination (SEE)**'. **Choice Based Credit System (CBCS)** and **Credit Based Semester System (CBSS)** as denoted by UGC, and curriculum/ programme structure as suggested by AICTE are followed.

3.2.2 Credit Courses:

All courses are to be registered by a student in a semester to earn credits. Credits shall be assigned to each course in a L: T: P/D: C (Lecture periods: Tutorial periods: Practicals / Drawing periods: Credits) Structure, based on the following general pattern ..

- One credit - for one hour/ week/ semester for Theory/ Lecture (L) courses;
- One credit - for two hours/ week/ semester for Laboratory/Practical (P) Courses or Drawing Periods (D).
- Two credits for three hours/ week/ semester for Laboratory/Practical (P) Courses or Drawing Periods (D).
- One credit for two hours / week /semester for activity oriented course "Logical reasoning".
- Other student activities (co-curricular and extra-curricular), namely, NCC, NSS, NSO, Study Tour, Guest Lecture etc. and identified Mandatory Courses, if any, shall not carry credits.

3.2.3 Course Classification:

All courses offered for the B.Tech. programme are broadly classified as: (a) Foundation Courses (FnC), (b) Core Courses (CoC), and (c) Elective Courses (EℓC).

- Foundation Courses (FnC) are further categorized as : (i) HS (Humanities and Social Sciences), (ii) BS (Basic Sciences), and (iii) ES (Engineering Sciences);
- Core Courses (CoC) and Elective Courses (EℓC) are categorized as PS (Professional Courses), which are further subdivided as – (i) PC (Professional/ Departmental Core) Courses, (ii) SC (Soft Core Courses - professional courses which can be opted from the given list along with the associated lab component) (iii) PE (Professional/ Departmental Electives) , (iv) OE (Open Electives); and (v) Project Works (PW);
- Minor Courses (1 or 2 Credit Courses, belonging to HS/ BS/ ES/ PC as per relevance).
- Mandatory course(s) (MC – Non credit oriented)

4.0 Course Work for B.Tech. Programme

4.1 A student, after securing admission, shall pursue the B.Tech. programme in a minimum period of 4 academic years, and a maximum period of 8 academic years (starting from the date of commencement of I Year).

4.2 Each student shall register for and secure the specified number of credits required for the completion of the B.Tech. programme and award of the B.Tech. degree in respective branch of Engineering.

4.3 Each semester is structured to provide typically 24 Credits (24 C), totaling to 192 credits (192 C) for the entire B.Tech. programme.

5.0 Course Registration

5.1 A 'Faculty Advisor or Counselor' shall be assigned to each student, who shall advise him about the B.Tech. programme, its structure along with curriculum, choice/option for courses, based on his competence, progress, pre-requisites and interest.

5.2 A Student may be permitted to Register for Course of his CHOICE with a typical total of 24 Credits per Semester (Minimum being 20 C and Maximum being 28 C, permitted deviation being ± 17%), based on his PROGRESS and SGPA/ CGPA, and study of the 'PRE-REQUISITES' as indicated for various Courses, in the Department Course Structure and Syllabus contents. However, a MINIMUM of 20 Credits per Semester must be registered to ensure the 'STUDENTSHIP' in any Semester.

5.3 Choice for 'additional courses' to reach the Maximum Permissible Limit of 28 Credits (above the typical 24 Credit norm) must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/ Counselor.

5.4 Academic section of the college invites 'Registration Forms' from students a priori (before the beginning of the semester). Registration requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'PRECEDING SEMESTER'.

5.5 A student can apply for registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from his faculty advisor, which should be submitted to the College Academic Committee through the Head of the Department (a copy of the same being retained with Head of the Department, Faculty Advisor and the student).

5.6 If the student submits ambiguous choices or multiple options or erroneous entries - during registration for the course(s) under a given/ specified course Group/ Category, namely, core elective with lab, professional elective and open elective as listed in the programme structure, Faculty Advisor shall rectify such errors and advise the student accordingly.

5.7 Course options exercised and approved by Faculty Advisor are final and CAN NOT be changed, and CANNOT be inter-changed; further, alternate choices shall also not be considered. However, if the course that has already been listed for registration (by the department) in a semester could not be offered due to any unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice - either for a new course (subject to offering of such a course), or for another existing course offered, which may be considered. Such alternate arrangements shall be made by the department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of class-work for that semester.

5.8 For **Mandatory Courses** like NCC/ NSS/ NSO etc., a '**Satisfactory Participation Certificate'** from the concerned authorities for the relevant semester is essential. No Marks or Grades or Credits shall be awarded for these activities.

6.0 Courses to be offered

6.1 A typical section (or class) strength for each semester shall be 60.

6.2 An Elective Course may be offered to the students, ONLY IF a Minimum of 20 students (1/3 of the Section Strength) opt for the same. The maximum strength of a section is limited to 80 (60 + 1/3 of the section strength).

6.3 More than ONE INSTRUCTOR may offer the SAME COURSE (Lab./Practicals may be included with the corresponding Theory course in the same semester) in any semester.

6.4 If more entries for registration of a course come into picture then the Head of the Department concerned shall decide whether or not to offer such a course for two or multiple sections.

6.5 In case of options coming from students of other departments/ branches/ disciplines (not considering OPEN ELECTIVES), PRIORITY shall be given to the student of the 'Parent Department'.

7 Attendance Requirements

7.1 A student shall be eligible to appear for the Semester End Examinations, if he acquires a minimum of 75% of attendance in lectures/tutorials/practicals/drawing/projects/seminars in aggregate of all the courses for that semester.

7.2 Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on valid medical grounds, or participation in sports, games, NCC, NSS, other co-curricular and extra-curricular activities, recognized for the purpose, and the participation having prior approval of the competent authority. Such condonation shall be based on the student's representation with supporting evidence.

7.3 A stipulated fee shall be payable towards condoning of shortage of attendance.

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

7.5 Students, whose shortage of attendance is not condoned in any semester, are not eligible to take their Semester End Examinations and they get detained and their registration for that semester shall stand cancelled. They shall not be promoted to the next semester. They may seek re-registration for all those courses registered in that semester in which they were detained, by seeking re-admission into that semester as and when offered. In the case of elective courses, namely, professional elective(s), soft-core with associated lab and / or open elective(s), the same may also be re-registered, if offered. However, if those elective(s) are not offered in later semesters, then alternate elective(s) may be chosen from the SAME set of elective course(s) offered under that specific category.

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

8 Academic Requirements

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in Section No.**7.**

8.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course, if he secures not less than 35% marks (for e.g. 25 out of 70 marks in theory course) in the Semester End Examination, and a minimum of 40% of marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing Pass (C) Grade or above in that course.

8.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Industry oriented Mini-Project/ Seminar, if he secures not less than 40% of the total marks to be awarded for each. The student would be treated as failed, if he - (i) does not submit a report on his Industry Oriented Mini-Project, or does not make a presentation of the same before the Departmental Evaluation Committee as per schedule, or (ii) does not present the Project Seminar as required in the IV year I Semester, or (iii) does not present the Technical Seminar as required in the IV year II Semester or (iv) secures less than 40% of marks in Industry oriented Mini-Project/ Seminar evaluations.
He may reappear once for each of the above evaluations, when they are scheduled again; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent semester, as and when it is scheduled.

8.3 Promotion Rules

8.3.1 Case (i):A student registers for 24 credits or more in each semester as per the provision in section 5.2

8.3.1.1 A student shall not be promoted from I Year to II Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 24 credits out of 48 credits or more the student has registered in first year, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.3.1.2 A student shall not be promoted from II Year to III Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 58 credits out of 96 credits or more the student has registered up to and including II Year II Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.3.1.3 A student shall not be promoted from III Year to IV Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 86 credits out of 144 credits or more the student has registered up to and including III Year II Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.3.2 Case (ii): A student registers for NOT less than 20 credits and less than 24 credits in each semester

8.3.2.1 A student shall not be promoted from I Year to II Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 50% of the credits registered in first year, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.3.2.2 A student shall not be promoted from II Year to III Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 60% of the credits registered up to and including II year II semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.3.2.3 A student shall not be promoted from III Year to IV Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 60% of the credits registered up to and including III year II semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.4 A Student shall register for all courses covering 192 credits as specified and listed (with the relevant courses as mentioned) in the Programme Structure, put up all the Attendance and Academic requirements for 192 Credits securing a minimum of C Grade (Pass Grade) or above in each course, and 'earn ALL 192 Credits securing SGPA ≥ 5.0 (in each Semester), and CGPA (at the end of each successive Semester) ≥ 5.0, to successfully complete the B.Tech. Programme.

8.5 A student must secure the necessary 192 credits as specified for the successful completion of the entire B.Tech. programme (see section 12.1); however, only 186 credits shall be considered for evaluating his overall performance for the award of class as provided for under section 12.0. These 186 credits shall be arrived at by leaving out two courses (one from open elective courses and one from professional elective courses) carrying a total of 6 credits, which have the least Grade point scores.

8.6 Students who fail to earn 192 credits as per the Programme Structure, and as indicated above, within 8 academic years from the date of commencement of their I Year shall forfeit their seats in B.Tech. Programme and their admissions shall stand cancelled.

8.7 A student detained due to shortage of attendance in any semester, may be re-admitted into that semester, as and when offered, with the Academic Regulations of the batch into which he gets readmitted. However, no grade allotments or SGPA/ CGPA calculations shall be done for the corresponding semester in which he got detained.

8.8 A student detained due to lack of credits in any year, may be readmitted in the next year, after fulfillment of the Academic Requirements, with the Academic Regulations of the batch into which he gets readmitted.

8.9 A student eligible to appear in the Semester End Examination in any course, but absent at it or failed (thereby failing to secure C Grade or above), may reappear for that course at the supplementary examination as and when conducted. In such cases, his Internal Marks (CIE) assessed earlier for that course shall be carried over, and added to the marks obtained in the supplementary examination, for evaluating his performance in that course.

9 Evaluation - Distribution and Weightage of Marks

9.1 The performance of a student in each semester shall be evaluated course-wise (irrespective of credits assigned) with a maximum of 100 marks for all types of courses, namely, theory, drawing, practicals, seminar (Project, Technical), Major project, Industry Oriented Mini-Project, Comprehensive Viva-Voce, Minor Courses etc.

The evaluations are as follows:

- Theory, practical, drawing and major project courses shall be evaluated based on 30% CIE (Continuous Internal Evaluation) and 70% SEE (Semester End Examination),
- Technical seminar and Major project seminar shall be evaluated based on 100% CIE (Continuous Internal Evaluation)
- Industry Oriented mini-project and comprehensive Viva-Voce shall be evaluated based on 100% SEE (Semester End Examination)

A letter grade corresponding to the % marks obtained shall be given for all courses.

9.2 a)

i. For theory courses (inclusive of Minor Courses), during the semester, there shall be TWO (2) mid-term examinations for 25 marks each. Each mid-term examination consists of one objective paper for TEN (10) marks, plus one subjective paper for 15 marks, with a duration of 120 minutes (20 minutes for objective and 100 minutes for subjective papers). Further, there shall be an allocation of 5 marks for assignment. The objective paper is set with multiple choice questions, True/ False, fill-in the blanks, matching type questions and short answer questions. Subjective paper shall contain 3 questions with internal choice, each for 5 marks. All three questions are to be answered.

ii. For "Logical Reasoning", a minor course, which is activity oriented, there shall be a continuous internal evaluation (CIE) during the semester for a total of 30 marks.

b) The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus.

c) The first assignment should be submitted before the conduct of the first mid-term examinations, and the second assignment should be submitted before the conduct of the second mid-term examinations. The assignments shall be as specified by the course instructor concerned.

d) The first mid-term examination marks and first assignment marks shall make one set of CIE marks , and the second mid-term examination marks and second assignment marks shall make second set of CIE Marks; and the average of these two sets of marks shall be taken as the final marks secured by the student in the Continuous Internal Evaluation in that theory course.

e) The details of the question paper pattern for Semester End Examination shall be as follows:

- The examination shall be conducted for 70 marks. The question paper consists of two parts:
  - Part – A for 20 marks (Compulsory);
  - Part – B for 50 marks (Questions with Internal Choice);
- Part – A: The question (numbered 01) under Part A consists of ten sub questions, two from each unit of the prescribed syllabus of the course. Each sub question carries 2 marks. All sub questions are compulsory.
- Part – B consists of five questions (numbered from 02 to 06), one each from the five units of the prescribed syllabus of the course. Each question carries 10 marks and may contain sub questions. For each question, there shall be an internal choice (it means, there shall be two questions from each unit, and the student should answer any one question). The student must answer all the questions of Part B.

Absence in mid-term examination(s):

- If any student is absent in one mid-term examination for any course on health grounds / any valid reasons approved by the College Academic Committee, only one test shall be conducted on all units by the college in each course at the end of each semester.
- If any student is absent in both mid-term examinations for any course on health grounds / any valid reasons approved by the College Academic Committee, only one test for 25 marks shall be conducted on all units and the marks secured out of 25 shall be divided by two, which shall be awarded against the said mid-term examination(s) after the student pays the prescribed fee.

9.3 For practical courses, there shall be a Continuous Internal Evaluation (CIE) during the semester for 30 marks, and 70 marks are assigned for lab/practical Semester End Examination (SEE). Out of the 30 marks for CIE, day-to-day work in the laboratory shall be evaluated for 15 marks; and for the remaining 15 marks - two internal practical tests (each of 15 marks) that include viva-voce shall be conducted by the concerned laboratory instructor and the average of these two tests is taken into account. The SEE for practicals shall be conducted at the end of the semester by two examiners, namely, an external examiner and laboratory faculty as internal examiner. The external examiner shall be appointed by the Chief Superintendent of Examinations of the college as per the recommendation of the Chairperson, Board of Studies of the department concerned. The panel of the external examiners shall be provided by the Chairperson, BoS at the commencement of the semester during the meeting of the BoS.

Absence in laboratory internal examinations:

- If any student is absent in one laboratory internal examination for any laboratory course on health grounds / for any valid reasons approved by the College Academic Committee, only one test shall be conducted for 15 marks on all experiments of that laboratory course, by the college at the end of the semester.
- If any student is absent in both the laboratory internal examinations on health grounds / for any valid reasons approved by the College Academic Committee, only one test shall be conducted on all experiments and the marks secured out of 15 marks shall be divided by two, which shall be awarded against the said laboratory internal examinations.

9.4 For the courses having design and/or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing, Production Drawing Practice, and Estimation), the distribution shall be 30 marks for CIE (20 marks for day-to-day work, and 10 marks for internal tests) and 70 marks for SEE. There shall be two internal tests in a semester and the average of the two shall be considered for the award of marks for internal tests.

9.5 **Open Electives**: Students are to choose Open Elective(s) as per their programme structure.

9.6 a) There shall be an Industry Oriented Mini-Project, in collaboration with an industry of the relevant specialization, to be registered immediately after III Year II semester examinations, and taken up during the summer vacation for four weeks duration.

b) The industry oriented mini-project shall be submitted in a report form, and a presentation of the same shall be made before a committee, which evaluates it for 100 marks. The committee shall consist of Head of the Department, the supervisor of Mini-Project, and two Professors /Assoc-Professors faculty members of the department. There shall be no internal marks for industry oriented Mini-Project. The mini-project shall be evaluated at the end of IV Year I Semester.

9.7 There shall be a project seminar presentation in IV Year I semester. For the project Seminar, the student shall collect the information/ literature on the project, prepare a report, submit the same, and present as a seminar, which shall be evaluated as CIE for 100 marks by the project seminar review committee. The committee shall consist of Head of the Department, the supervisor of project, and two Professors/Associate professors of the department.

9.8

9.8.1 There shall be a technical seminar presentation in IV year II Semester. For the technical seminar a student shall collect information on a specialized technical topic, prepare a technical report and submit to the department at the time of Technical Seminar presentation. The Technical Seminar presentation (along with the Technical Report) shall be evaluated by Two Professors /Assoc-Professors and Head of the Department, for 100 marks. There shall be no SEE for seminar.

9.8.2 For courses, namely, "Gender Sensitization" and "Human Values and Professional Ethics", which are activity oriented minor courses of two credits, there shall be a SEE for Seventy (70) marks which shall be conducted with internal examiner(s) only.

9.8.3. For "Logical Reasoning" an activity oriented course, there shall be a SEE for Seventy (70) marks which shall be conducted with internal examiner(s) only.

9.9 There shall be a comprehensive viva-voce examination (SEE) for 100 marks in IV year II semester. It shall be conducted by an external examiner, Head of the department and two Professors / Assoc-Professors of the department.

9.10 Each student shall start the major project work during the IV Year I Semester, as per the instructions of the project guide/ project supervisor assigned by the Head of Department. Out of a total 100 marks allotted for the major project work, which shall be evaluated in IV year II semester, 30 marks shall be for CIE (Continuous Internal Evaluation) and 70 marks for the SEE (End Semester Viva-voce Examination). The project viva-voce shall be conducted by a committee comprising an external examiner, Head of the Department and project supervisor. Out of 30 marks allocated for CIE, 15 marks shall be awarded by the project supervisor (based on the continuous evaluation of student's performance throughout the Project Work period), and the other 15 marks shall be awarded by a Departmental Committee consisting of Head of the Department and Project Supervisor, and two Professors/Assoc-Professors, based on the work carried out and the presentation made by the student during internal reviews (at least two internal reviews shall be conducted).

10.0 Grading Procedure

10.1 Marks shall be awarded to indicate the performance of each student in each theory course, or lab/practicals, or project seminar, technical seminar, or major project, or mini-project based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in section 9 above, and a corresponding letter grade shall be given.

10.2 As a measure of the student's performance, a 10-point absolute grading system using the following letter grades (UGC Guidelines) and corresponding percentage of marks shall be followed as mentioned in the table 10.2. Please also refer to section 8.

Table 10.2: Absolute grading system

% of Marks Secured in a course	*Letter Grade (UGC Guidelines)*	*Grade Points*
More than or equal to 90%	**O (Outstanding)**	**10**
80 and less than 90%	**A^+ (Excellent)**	**9**
70 and less than 80%	**A (Very Good)**	**8**
60 and less than 70%	**B^+ (Good)**	**7**
50 and less than 60%	**B (Average)**	**6**
40 and less than 50%	**C (Pass)**	**5**
Below 40%	**F (FAIL)**	**0**
Absent	**Ab**	**0**

10.3 A student obtaining F Grade in any course shall be considered '**FAILED**' and shall be required to reappear as 'supplementary candidate' in the Semester End Examination (SEE), as and when offered. In such cases, his internal marks (CIE Marks) in those course(s) shall remain the same as those obtained earlier.

10.4 A letter grade does not imply any specific % of Marks.

10.5 In general, a student shall not be permitted to repeat any course(s) only for the sake of 'grade improvement' or 'SGPA/ CGPA improvement', However, he has to repeat all the courses pertaining to that semester, when he is detained due to shortage of attendance as listed in section 8.7.

10.6 A student earns Grade Point (GP) in each Course, on the basis of the letter grade obtained by him in that course. Then the corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Course.
Credit Points (CP) = Grade Point (GP) x Credits …. for a course

10.7 The Student passes the course only when he gets GP $\geq$ 5 (C grade or above).

10.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of Credit Points (ΣCP) secured from ALL Subjects/ Courses registered in a semester, by the Total Number of Credits registered during that semester. SGPA is rounded off to TWO decimal places. SGPA is thus computed as

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

where 'i' is the course indicator index (takes into account all courses in a semester), 'N' is the no. of courses 'REGISTERED' for the semester (as specifically required and listed under the Program Structure of the parent department), 'C_i' is the no. of credits allotted to the i^{th} course, and 'G_i' represents the Grade Points (GP) corresponding to the letter grade awarded for that i^{th} course.

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

$$\text{CGPA} = \{\sum_{j=1}^{M} C_j G_j\} / \{\sum_{j=1}^{M} C_j\} \ \ldots \ \text{for all S Semesters registered (ie., upto and inclusive of S Semesters, } S \geq 2\text{)},$$

where 'M' is the TOTAL no. of courses (as specifically required and listed under the Course Structure of the parent department) the Student has 'REGISTERED' from the 1st semester onwards up to and inclusive of the semester S (obviously M > N), 'j' is the course indicator index (takes into account all Courses from 1 to S Semesters),'C_j' is the no. of credits allotted to the j^{th} course, and 'G_j' represents the Grade Points (GP) corresponding to the letter grade awarded for that j^{th} Course. After registration and completion of I Year I semester however, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

10.10 For merit ranking or comparison purposes, or any other listing, ONLY the 'ROUNDED OFF' values of the CGPAs shall be used.

10.11 For calculations listed in sections 10.6 through 10.10, performance in FAILED courses (securing F Grade) shall also be taken into account, and the credits of such courses shall also be included in the multiplications and summations.

10.12 Passing Standards:

10.12.1 A student shall be declared **'SUCCESSFUL'** or **'PASSED'** in a semester, only when he gets a SGPA ≥ 5.00 (at the end of that particular Semester); and a student shall be declared **'SUCCESSFUL'** or **'PASSED'** in the entire B.Tech. programme, only when he gets a CGPA ≥ 5.00, subject to the condition that he secures a GP ≥ 5 (C Grade or above) in every registered course in each semester (during the entire B.Tech. Programme) for award of the degree.

10.12.2 After the completion of each semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It shall show the details of the courses registered (course code, title, no. of credits, grade earned etc.), credits earned, SGPA, and CGPA.

11. Declaration of Results

11.1 Computation of SGPA and CGPA are done using the procedure listed in sections 10.6 through 10.10.

11.2 For final % of marks equivalent to the computed final CGPA, the following formula is to be used:

% of Marks = (final CGPA – 0.5) x 10

12.0 Award of Degree

12.1 A student who registers for all the specified courses as listed in the programme structure, satisfies all the programme requirements, and passes all the examinations prescribed in the entire B.Tech. programme, and secures the required number of 192 credits (with CGPA ≥ 5.0), within 8 academic years from the date of commencement of the first academic Year, shall be

declared to have **'QUALIFIED'** for the award of the B.Tech. degree in branch of Engineering studied.

12.2 A student who qualifies for the award of the degree as listed in section 12.1, shall be placed in the following classes based on evaluation as per section 8.5:

12.2.1 Students with final CGPA (at the end of the B. Tech Programme) ≥ 8.00, and fulfilling the following conditions shall be placed in 'FIRST CLASS with DISTINCTION' -

i. should have passed all the subjects/courses in 'FIRST APPEARANCE' within the first 4 academic years (or 8 sequential semesters) from the date of commencement of his first academic year,
ii. should have secured a CGPA ≥ 8.00, at the end of each of the 8 sequential semesters, starting from the I Year I semester onwards,
iii. should not have been detained or prevented from writing the Semester End Examinations in any semester due to shortage of attendance or any other reason,.

12.2.2 Students having final CGPA (at the end of B.Tech. Programme) ≥ 8.00, but not fulfilling the above conditions shall be placed in 'FIRST CLASS'.

12.2.3 Students with final CGPA (at the end of the B.TECH. Programme) ≥ 6.50 but < 8.00, shall be placed in 'FIRST CLASS'.

12.2.4 Students with final CGPA (at the end of the B.TECH. Programme) ≥ 5.50 but < 6.50, shall be placed in 'SECOND CLASS'.

12.2.5 All other Students who qualify for the award of the degree (as per Section 12.1), with final CGPA (at the end of the B.Tech. Programme) ≥ 5.00 but < 5.50, shall be placed in 'PASS CLASS'.

12.3 A student with final CGPA (at the end of the B.Tech. Programme) < 5.00 shall not be eligible for the award of the degree.

12.4 Students fulfilling the conditions listed under section (iii) of 12.2.1 alone shall be eligible for the award of 'college rank' and / or 'gold medal'.

13.0 Withholding of Results

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

14.0 Transitory Regulations

14.1 General

14.1.1 A Student who has discontinued for any reason, or has been detained for want of attendance or NOT promoted due to lack of required credits as specified, may be considered eligible for readmission to the same semester in which he got detained for want of attendance or promotion to the next year of study after securing the required number of credits, as detailed in 14.2 -14.4 as the case may be.

14.2 For students detained due to shortage of attendance:

14.2.1 A Student who has been detained in I year of R09/R13/R15 Regulations of JNTUH due to lack of attendance, shall be permitted to join I year I Semester of AR16 Regulations of GCET and he is required to complete the study of B.Tech. programme within the stipulated period of eight academic years from the date of first admission in I Year.

14.2.2 A student who has been detained in any semester of II, III and IV years of R09/R13/R15 regulations of JNTUH for want of attendance shall be permitted to join the corresponding semester of AR16 regulations of GCET and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year.

The AR16 Academic Regulations of GCET under which a student has been readmitted shall be applicable to that student from that semester which shall include section 14.5

14.3 For students NOT promoted due to shortage of credits:

14.3.1 A student of R09/R13/R15 Regulations of JNTUH who has been detained due to lack of credits, shall be promoted to the next semester of AR16 Regulations of GCET only after acquiring the required credits as per the corresponding regulations of his/her first admission. For subsequent promotions the rule specified in section 14.5 shall be applicable. The student is required to complete the study of B.Tech within the stipulated period of eight academic years from the year of first admission. The AR16 Academic Regulations of GCET are applicable to a student from the year of readmission onwards.

14.4 For all students readmitted under AR16 Regulations of GCET:

14.4.1 A student who has failed in any course under any regulation has to pass those courses in the same regulations.

14.4.2 A student shall acquire a total of 192 credits for the award of degree. These 192 credits shall be the sum of all the credits secured in all the other regulations of his study (subsequent to normalization as per section 14.5) and those secured under AR16 Regulations of GCET.

14.4.3 If a student readmitted to AR16 Regulations of GCET, has any course with about 80% of syllabus in common with his previous regulations, that particular course in AR16 Regulations of GCET shall be substituted by another course to be suggested by GCET.

14.4.4 If a student readmitted to AR16 Regulations of GCET, has not studied any course/topics in his earlier regulations of study which is a prerequisite for further courses in AR16 Regulations of GCET, the College shall arrange to conduct remedial classes to cover those course/topics for the benefit of the students.

14.5 Promotion Rule

Where the credits allotted to a semester/year under the regulations studied in are different from that under AR16 regulations for the corresponding semester/year, the promotion rules of AR16 vide section 8.3 shall be applied after normalization. Normalization is done by scaling down or up the number of credits of a semester/year under the previous regulations to equal the number of credits of the corresponding semester/year under AR16 regulations and revising the secured credits also in the same proportion.

15.0 Student transfers

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

15.2 The student seeking transfer from various other universities/institutions has to pass the failed courses which are equivalent to the courses of GCET, and also pass the courses of GCET which the student has not studied at the earlier institution. Further, even if the student had passed some of the courses at the earlier institutions, if the same courses are prescribed in different semesters of GCET, the student has to study those courses in GCET in spite of fact that those courses are repeated.

15.3 The transferred students from other universities/institutions shall be provided one chance to write the internal examinations in the failed courses and/or courses not studied as per the clearance (equivalence) letter issued by JNTUH.

16.0 Scope

i) Where the words "he", "him", "his", occur in the write-up of regulations, they include "she", "her", "hers".
ii) Where the words "Subject" or "Subjects", occur in these regulations, they also imply "Course" or "Courses".
iii) The Academic Regulations should be read as a whole, for the purpose of any interpretation.
iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Head of the Institution is final.
v) The college may change or amend the Academic Regulations, Program Structure or Syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the dates notified by the College Authorities.
vi) B.Tech (Regular) program is B.Tech 4 year degree program to which students are admitted to I year
vii) B.Tech LE Scheme refers to the system under which students are admitted to II year of the B.Tech 4 year degree program.

*** * * * ***

PUNISHMENT FOR MALPRACTICE

	Nature of Malpractices	Punishment
	If the candidate:	
1 (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
1 (b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he shall be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor is an outsider, he shall be handed over to the police and a case is registered against him.
4	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.

6	Refuses to obey the orders of the Chief Superintendent / Assistant –Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they shall be handed over to the police and a police case is registered against them.
7	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is course to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College shall be handed over to police and, a police case shall be registered against them.

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY
HYDERABAD
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ACADEMIC REGULATIONS 2016
For CBCS Based B.Tech. (Lateral Entry (LE) Scheme)

(Effective for the students admitted into II year from the Academic Year **2017-18** and onwards)

1.0 Eligibility for Admission

1.1 Admission to the B.Tech. Programme shall be made either on the basis of the merit rank obtained by the qualifying candidate at an entrance test conducted by the Telangana State Government (ECET), or the JNTUH, or on the basis of any other order of merit approved by JNTUH, subject to reservations as prescribed by the Government of Telangana from time to time.

Admissions under the Lateral Entry Scheme are made into the Second (II) year of the Four (4) – year degree program

2.0 Course Work:

2.1 A student, after securing admission, shall pursue the B.Tech. programme in a minimum period of 3 academic years, and a maximum period of 6 academic years (starting from the date of commencement of II Year).

2.2 Each student shall register for and secure the specified number of credits required for the completion of the B.Tech. programme and award of the B.Tech. degree in respective branch of Engineering.

2.3 Each semester is structured to provide typically 24 Credits, totaling to 144 credits for the entire B.Tech. (LE) programme.

3.0 Promotion rules

3.1 Case (i): A student registers for 24 credits or more in each semester as per the provision in section 5.2 of AR16 regulations of B.Tech (Regular) four year degree program.

3.1.1 A student shall not be promoted from II Year to III Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 29 credits out of 48 credits or more the student has registered up to and including II Year II Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

3.1.2 A student shall not be promoted from III Year to IV Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 58 credits out of 96 credits or more the student has registered up to and including III Year II Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

3.2 Case (ii): A student registers for NOT less than 20 credits and less than 24 credits in each semester.

3.2.1 A student shall not be promoted from II Year to III Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 60% of the credits registered up to and including II year II semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

3.2.2 A student shall not be promoted from III Year to IV Year, unless he fulfills the attendance and Academic Requirements and secures a minimum of 60% of the credits registered up to and including III year II semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

4.0 A Student shall register for all courses covering 144 credits as specified and listed (with the relevant courses as mentioned) in the Programme Structure, put up all the Attendance and Academic requirements for 144 Credits securing a minimum of C Grade (Pass Grade) or above in each course, and earn ALL 144 Credits securing SGPA ≥ 5.0 (in each Semester), and CGPA (at the end of each successive Semester) ≥ 5.0, to successfully complete the B.Tech. programme.

4.1 A student must secure the necessary 144 credits as specified for the successful completion of the entire B.Tech. programme (see section 5.1); however, only 138 credits shall be considered for evaluating his overall performance for the award of class as provided for under section 5.0. These 138 credits shall be arrived at by leaving out two courses (one from open elective courses and one from professional elective courses) carrying a total of 6 credits, which have the least Grade point scores.

4.2 Students who fail to earn 144 credits as per the Programme Structure, and as indicated above, within 6 academic years from the date of commencement of their II Year shall forfeit their seats in B.Tech. Programme and their admissions shall stand cancelled.

5.0 Award of Degree

5.1 A student who registers for all the specified courses as listed in the programme structure, satisfies all the programme requirements, and passes all the examinations prescribed in the entire B.Tech. programme, and secures the required number of 144 credits (with CGPA ≥ 5.0), within 6 academic years from the date of commencement of the second academic Year, shall be declared to have **'QUALIFIED'** for the award of the B.Tech. degree in the chosen branch of Engineering.

5.2 A student who qualifies for the award of the degree as listed in section 5.1, shall be placed in the appropriate class as follows based on evaluation as per section 4.1:

5.2.1 Students with final CGPA (at the end of the B. Tech Programme) ≥ 8.00, and fulfilling the following conditions shall be placed in 'FIRST CLASS with DISTINCTION'.

i. should have passed all the subjects/courses in 'FIRST APPEARANCE' within the first 3 academic years (or 6 sequential semesters) from the date of commencement of his first academic year,
ii. should have secured a CGPA ≥ 8.00, at the end of each of the 6 sequential semesters, starting from the II Year I semester onwards,
iii. should not have been detained or prevented from writing the Semester End Examinations in any semester due to shortage of attendance or any other reason, thereof.

5.2.2 Students having final CGPA (at the end of B.Tech. Programme) ≥ 8.00, but not fulfilling the above conditions shall be placed in 'FIRST CLASS'.

5.2.3 Students with final CGPA (at the end of the B.TECH. Programme) ≥ 6.50 but < 8.00, shall be placed in 'FIRST CLASS'.

5.2.4 Students with final CGPA (at the end of the B.TECH. Programme) ≥ 5.50 but < 6.50, shall be placed in 'SECOND CLASS'.

5.2.6 All other Students who qualify for the award of the degree (as per section 5.1), with final CGPA (at the end of the B.Tech. Programme) ≥ 5.00 but < 5.50, shall be placed in 'PASS CLASS'.

5.3 A student with final CGPA (at the end of the B.Tech. Programme) < 5.00 shall not be eligible for the award of the degree.

5.4 Students fulfilling the conditions listed under Item (iii) of 5.2.1 alone shall be eligible for the award of 'college rank' and / or 'gold medal'.

6.0 Transitory Regulations

6.1 General

6.1.1 A Student who has discontinued for any reason, or has been detained for want of attendance or NOT promoted due to lack of required credits as specified, may be considered eligible for readmission to the same semester in which he got detained for want of attendance or promotion to the next year of study after securing the required number of credits, as detailed in sections 6.2 through 6.4 as the case may be.

6.2 For students detained due to shortage of attendance:

6.2.1 A student who has been detained in any semester of II, III and IV years of R09/R13/R15 regulations of JNTUH for want of attendance shall be permitted to join the corresponding semester of AR16 regulations of GCET and is required to complete the study of B.Tech. within the stipulated period of six academic years from the date of first admission in II Year.

The AR16 Academic Regulations of GCET under which a student has been readmitted shall be applicable to the student from that semester which shall include section 6.5.

6.3 For students NOT promoted due to shortage of credits:

6.3.1 A student of R09/R13/R15 Regulations of JNTUH who has NOT been promoted due to lack of credits, shall be promoted to the next semester under AR16 Regulations of GCET only after acquiring the required credits as per the corresponding regulations of his/her first admission. For subsequent promotions, the rule specified in section 6.5 shall be applicable. The student is required to complete the study of B.Tech within the stipulated period of SIX academic years from the year of first admission. The AR16 Academic Regulations of GCET are applicable to a student from the year of readmission onwards.

6.4 For all students readmitted under AR16 Regulations of GCET:

6.4.1 A student who has failed in any course under any regulation has to pass those courses in the same regulations.

6.4.2 A student shall acquire a total of 144 credits for the award of degree. These 144 credits shall be the sum of all the credits secured in all the other regulations of his study (subsequent to normalization as per section 6.5) and those secured under AR16 Regulations of GCET.

6.4.3 If a student readmitted to AR16 Regulations of GCET, has any course with about 80% of syllabus in common with his previous regulations, that particular course in AR16 Regulations of GCET shall be substituted by another course to be suggested by GCET.

6.4.4 If a student readmitted to AR16 Regulations of GCET, has not studied any course/topics in his earlier regulations of study which is a prerequisite for further courses in AR16 Regulations of GCET, the College shall arrange to conduct remedial classes to cover those course/topics for the benefit of the students.

6.5 **Promotion Rule**

Where the credits allotted to a semester/year under the regulations studied in are different from that under AR16 regulations for the corresponding semester/year, the promotion rules of AR16 vide section 3.0 shall be applied after normalization. Normalization is done by scaling down or up the number of credits of a semester/year under the previous regulations to equal the number of credits of the corresponding semester/year under AR16 regulations and revising the secured credits also in the same proportion.

7.0 All the other regulations as applicable to B.Tech 4 – year degree program (Regular) shall hold good for B.Tech LE Scheme.

PUNISHMENT FOR MALPRACTICE

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

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

	the script or any part thereof inside or outside the examination hall.	course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is course to the academic regulations in connection with forfeiture of seat.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College shall be handed over to police and, a police case shall be registered against them.

GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY
Cheeryal (V), Keesara (M), Medchal Dist. 501301
(Autonomous)

DEPARTMENT OF MECHANICAL ENGINEERING

B.Tech. Program in Mechanical Engineering

VISION

The Mechanical Engineering Department strives to be recognized globally for outstanding education and research leading to well-qualified engineers, who are innovative, entrepreneurial and successful in solving problems of society.

MISSION

1. Imparting quality education to students to enhance their skills and make them globally competitive.
2. Prepare its graduates to pursue life-long learning, serve the profession and meet intellectual, ethical and career challenges.
3. Maintain a vital, state-of-the-art research to provide its students and faculty with opportunities to create, interpret, apply and disseminate knowledge.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The Program Educational Objectives of Mechanical Engineering Program are developed to provide guidance to graduating Mechanical Engineers, so that they can contribute effectively to the advancement of needs of Mechanical Engineering Profession.

The graduates from Mechanical Engineering program are expected to demonstrate within three to five years of graduation that they would

PEO1	Be on a successful career path as competent professionals in their chosen profession or pursue advanced study, actively pursue lifelong learning for professional development.
PEO2	Serve their professional roles to meet the needs of engineering and society exhibiting professional ethics, interpersonal skills while working in multicultural teams.
PEO3	Be creative and innovative in their professional settings, including contributions to multidisciplinary areas.

PROGRAM OUTCOMES (POs)

Program Outcomes (POs) describe what students are expected to know and be able to do by the time of graduation to accomplish Program Educational Objectives (PEO's). The Program Outcomes for Mechanical Engineering students are:

PO1	**Engineering Knowledge:** An ability to apply knowledge of mathematics, science and engineering fundamentals to model, analyse and obtain solution for real-life engineering problems
PO2	**Problems Analysis:** Ability to Identify, formulate and analyze engineering problems including thermal, manufacturing and industrial systemsarriving at meaningful conclusions involving mathematical inferences.
PO3	**Design/Development of Solutions:** Ability to Design, implement, and evaluate systems and processes considering public health, safety, cultural, societal and environmental issues.
PO4	**Conduct investigations of complex problems:** An ability to Design and conduct experiments using domain knowledge and analyze data to arrive at valid conclusions.
PO5	**Modern tool usage:** Ability to apply current techniques, skills, knowledge and computer based methods & tools to develop systems with an understanding of the limitations.
PO6	**The Engineer and society:** Ability to understand the effect of engineering solutions on legal, cultural, social, public health and safety aspects.
PO7	**Environment and team work:** Apply knowledge of contemporary issues to investigate and solve problems with a concern for sustainability and eco-friendly environment.
PO8	**Ethics:** Ability to apply ethical principles to engineering practices and professional responsibilities.
PO9	**Individual and team work:** Ability to function effectively in teams, in diverse and multidisciplinary areas to accomplish common goals.
PO10	**Communication:** Ability to comprehend, design documentation, write effective reports, make effective presentations to the engineering community and society at large.
PO11	**Project management and finance:** An understanding of engineering and management principles and apply these to work, as a member and leader in a team, to manage projects in multidisciplinary environment.
PO12	**Life-long learning:** Ability to engage in independent and life-long learning in the broad context of technological changes and advancements.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1	Apply Continuity, Energy and Momentum equations to mechanical systems, design and perform experiments in all fields of mechanical engineering.
PSO2	Able to function in software industry in the areas of Design and development of mechanical systems using software tools such as AUTO CAD, Solid works, ANSYS, Pro E, CATIA etc.
PSO3	Able to work in power plants and manufacturing industry in the sphere of operation and maintenance.

GEETHANJALI COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION
B.Tech. MECHANICAL ENGINEERING

Academic Regulations: AR 16 **Academic Year 2016-17**

PROGRAM STRUCTURE

FIRST YEAR – SEMESTER – I

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1	16EN1101	English - I	HS	2	-	-	30	70	100	2
2	16PH1101	Engineering Physics	BS	3	1	-	30	70	100	3
3	16MA1101	Mathematics – I	BS	4	1	-	30	70	100	4
4	16CS1102	Introduction to Computer Programming	ES	3	-	-	30	70	100	3
5	16ME1102	Engineering Mechanics - I	ES	2	1	-	30	70	100	2
6	16ME1101	Engineering Drawing	ES	2	-	3	30	70	100	4
7	16PH11L1	Engineering Physics Lab	BS	-	-	3	30	70	100	2
8	16CS11L2	Computer Programming Lab	ES	-	-	3	30	70	100	2
9	16WS11L1*	EWS and ITWS	ES	-	-	3	30	70	100	2
Total				**16**	**3**	**12**	**270**	**630**	**900**	**24**
Total Periods per Week				**31**						

*CSE BoS specified the syllabus for ITWS while ME BoS specified the syllabus for EWS

Abbreviation	Description
HS	Humanities and Social Sciences
BS	Basic Sciences
ES	Engineering Sciences
PC	Professional Core
SC	Soft Core
OE	Open Elective
PE	Professional Elective
CC	Core Course

Abbreviation	Description
L	Lecture
T	Tutorial
P	Practical
D	Drawing
C	Number of Credits
CIE	Continuous Internal Evaluation
SEE	Semester End Examination
Tot	Total

FIRST YEAR – SEMESTER – II

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1	16EN1201	English –II	HS	2	-	-	30	70	100	2
2	16PH1203	Physics for Engineers	BS	3	1	-	30	70	100	3
3	16MA1201	Mathematics-II	BS	3	1	-	30	70	100	3
4	16CH1201	Engineering Chemistry	BS	3	-	-	30	70	100	3
5	16MA1202	Mathematics –III	BS	3	-	-	30	70	100	3
6	16ME1201	Engineering Mechanics –II	ES	2	1	-	30	70	100	2
7	16ME12L1	Machine Drawing	PC	1	-	3	30	70	100	3
8	16CH12L1	Engineering Chemistry Lab	BS	-	-	3	30	70	100	2
9	16MA12L1	Computational Mathematics Lab	BS	-	-	3	30	70	100	2
10	16EN12L2	English Lab	HS	-	-	2	30	70	100	1
Total				**17**	**3**	**11**	**300**	**700**	**1000**	**24**
Total Periods per Week				**31**						

SECOND YEAR – SEMESTER – I

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1	16ME2101	Thermodynamics	PC	4	1	-	30	70	100	4
2	16ME2102	Mechanics of Solids	PC	4	1	-	30	70	100	4
3	16ME2103	Metallurgy and Material Science	PC	3	-	-	30	70	100	3
4	16MA2101	Probability and Statistics	BS	4	1	-	30	70	100	4
5	16EE2105	Basic Electrical and Electronics Engineering	ES	3	1	-	30	70	100	3
6	16ME21L1	Metallurgy and Mechanics of Solids Lab.	PC	-	-	3	30	70	100	2
7	16ME21L2	Engineering Drawing with Auto CAD	PC	-	-	3	30	70	100	2
8	16EE21L3	Basic Electrical and Electronics Engineering Lab	ES	-	-	3	30	70	100	2
Total				**18**	**4**	**9**	**240**	**560**	**800**	**24**
Total Periods per Week				**31**						

SECOND YEAR – SEMESTER – II

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1	16ME2201	Kinematics of Machinery	PC	3	1	-	30	70	100	3
2	16ME2202	Thermal Engineering – I	PC	3	1	-	30	70	100	3
3	16ME2203	Production Technology - I	PC	4	-	-	30	70	100	4
4	16ME2204	Mechanics of Fluids and Hydraulic Machinery	ES	3	1	-	30	70	100	3
5	16CH2201	Environmental Studies	HS	3	-	-	30	70	100	3
6	16ME22L1	Mechanics of Fluids and Hydraulic Machinery Lab	ES	-	-	3	30	70	100	2
7	16ME22L2	Production Technology - I Lab	PC	-	-	3	30	70	100	2
8	16ME22L3	Kinematics of Machinery Lab	PC	-	-	3	30	70	100	2
9	16HS22L1	Gender Sensitization	HS	-	-	3	30	70	100	2
Total				**16**	**3**	**12**	**270**	**630**	**900**	**24**
Total Periods per Week				**31**						

THIRD YEAR – SEMESTER – I

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1	16ME3101	Instrumentation and Control Systems	PC	4	1	-	30	70	100	4
2	16ME3102	Production Technology - II	PC	3	1	-	30	70	100	3
3	16ME3103	Thermal Engineering – II	PC	4	1	-	30	70	100	4
4	16ME3104	Design of Machine Elements – I	PC	4	1	-	30	70	100	4
5	**Open Elective - I**		OE	3	-	-	30	70	100	3
	16MB3121	Intellectual Property Rights								
	16EE3122	Industrial Safety and Hazards								
	16CS3123	JAVA Programming								
	16EC3124	Electronic Measuring Instruments								
	16CE3126	Global Warming and Climate Change								
6	16ME31L1	Thermal Engineering Lab	PC	-	-	3	30	70	100	2
7	16ME31L2	Production Technology - II Lab	PC	-	-	3	30	70	100	2
8	16EN31L1	Advanced English Communication Skills Lab	HS	-	-	3	30	70	100	2
Total				**18**	**4**	**9**	**240**	**560**	**800**	**24**
Total Periods per Week				**31**						

THIRD YEAR – SEMESTER – II

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1	16ME3201	Dynamics of Machinery	PC	3	1	-	30	70	100	3
2	16ME3202	Design of Machine Elements – II	PC	3	1	-	30	70	100	3
3	16ME3203	Finite Element Methods	PC	3	-	-	30	70	100	3
4	**Soft Core –I**		SC	3	-	-	30	70	100	3
	16ME3204	CAD/CAM								
	16ME3205	Design for Manufacturing								
5	**Professional Elective – I**		PE	3	-	-	30	70	100	3
	16ME3206	Design and Analysis of Experiments								
	16ME3207	Automobile Engineering								
	16ME3208	Materials Management								
	16ME3209	Tool Design								
6	**Professional Elective – II**		PE	3	-	-	30	70	100	3
	16ME3210	Computational Fluid Dynamics								
	16ME3211	Refrigeration and Air Conditioning								
	16ME3212	Additive Manufacturing								
	16ME3213	Composite Materials								
7	16ME32L1	Digital Fabrication and Instrumentation Lab	PC	-	-	3	30	70	100	2
8	**Soft Core - I Lab**		SC	-	-	3	30	70	100	2
	16ME32L2	CAM/CAE Lab								
	16ME32L3	Design for Manufacturing Lab								
9	16MB32P1	Human Values and Professional Ethics	HS	-	-	3	30	70	100	2
Total				**18**	**2**	**9**	**270**	**630**	**900**	**24**
Total Periods per Week				**29**						

FOURTH YEAR – SEMESTER – I#

Subject to final approval by Academic Council

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1	16ME4101	Heat Transfer	PC	3	1	-	30	70	100	3
2	16ME4102	Operations Research	PC	3	1	-	30	70	100	3
3	**Soft Core – II**		SC	3	1	-	30	70	100	3
	16ME4103	Industrial Engineering and Management								
	16ME4104	Production Planning and Control								
4	**Professional Elective – III**		PE	3	-	-	30	70	100	3
	16ME4105	Non-destructive Testing								
	16ME4106	Robotic Engineering								
	16ME4107	Work Study and Ergonomics								
	16ME4108	Mechatronics								
5	**Open Elective - II**		OE	3	-	-	30	70	100	3
	16MB4131	Supply Chain Management								
	16CS4132	Knowledge Management								
	16EE4133	Energy Conservation and Management								
	16EC4134	Basics of Communication Systems (ECE)								
	16CE4136	Building Technology								
6	**Open Elective – III**		OE	3	-	-	30	70	100	3
	16MB4141	Banking and Insurance								
	16CS4142	Database Systems								
	16EE4143	Micro-Electro-Mechanical Systems								
	16EC4144	Principles of Wireless Communication Systems (ECE)								
	16CE4146	Green Buildings								

	16EN4147	Foreign Language-French								
	16EN4148	Foreign Language-Spanish								
	16EN4149	Foreign Language-German								
7	**Soft Core - II Lab.**		SC	-	-	3	30	70	100	2
	16ME41L1	Work Study Lab								
	16ME41L2	Facility Design Lab								
8	16ME41L3	Heat Transfer Lab	PC	-	-	3	30	70	100	2
9	16ME4111	Industry Oriented Mini Project	CC	-	-	-	-	100	100	1
10	16ME4112	Major Project Seminar	CC	-	-	2	100	-	100	1
Total				**18**	**3**	**08**	**340**	**660**	**1000**	**24**
Total Periods per Week				**31**						

FOURTH YEAR - SEMESTER – II#

Subject to final approval by Academic Council

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	C
1	16MB4201	Financial Analysis and Project Management	HS	4	-	-	30	70	100	4
2	**Professional Elective – IV**		PE	3	-	-	30	70	100	3
	16ME4201	Plant Layout and Materials Handling								
	16ME4202	Un-Conventional Machining Processes								
	16ME4203	Engineering Acoustics								
	16ME4204	Power Plant Engineering								
3	**Open Elective –IV**		OE	3	-	-	30	70	100	3
	16MB4251	Entrepreneurship								
	16CS4252	Web Development								
	16EE4253	Renewable Energy Sources								
	16EC4254	Biomedical Instrumentation								
	16CE4256	Disaster Mitigation and Management								
	16MA4257	Actuarial Statistics								
4	16ME4206	Technical Seminar	CC	-	-	2	100	-	100	1
5	16ME4207	Comprehensive Viva	CC	-	-	-	-	100	100	3
6	16ME4208	Major Project	CC	-	-	15	30	70	100	10
Total				**10**	**-**	**17**	**220**	**380**	**600**	**24**
Total Periods per Week				**27**						

Comparison of AICTE Guidelines for Curriculum Structure of B.Tech. Degree Program in Mechanical Engineering Vis-a-vis GCET program

S. No.	Broad Course Classification	Course Group/ Category	Course Description	Proposed Credits (%)	Range of Credits given by AICTE
1	Foundation Courses (FnC)	BS –Basic Sciences	Includes - Mathematics, Physics and Chemistry Subjects	29 (15.10%)	15% - 20%
2		ES – Engineering Sciences	Includes fundamental engineering subjects	26 (13.54%)	15% - 20%
3		HS – Humanities and Social Sciences	Includes subjects related to Humanities, Social Sciences and Management	16 (8.33%)	5%-10%
4	Core Courses (CoC)	PC – Professional Core	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engineering.	70 (36.45%)	30% - 40%
5	Elective Courses (ElC)	SC- Soft Core	Includes core elective courses with the associated lab	10 (5.2%)	10% -15%
		PE – Professional Electives	Includes Elective subjects related to the Parent Discipline/ Department/ Branch of Engg.	13 (6.77%)	
6		OE – Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department/ Branch of Engg.	12 (6.25%)	5% - 10%
7	Core Courses (CC)	Project Work	B.Tech. Project or UG Project or UG Major Project	16 (8.3%)	10% - 15%
8		Industrial Training/ Mini-Project	Industrial Training/ Internship/ UG Mini-Project/ Mini-Project		
9		Seminar	Seminar/ Colloquium based on core contents related to Parent Discipline/ Department/ Branch of Engineering.		
10		Minor Courses	1 or 2 Credit Courses (subset of HS)	included	
Total Credits for B. Tech. Programme				192 (100%)	

OPEN ELECTIVES offered by a Department SHOULD NOT be taken by the students of the same department

Open Elective I

S. No.	Course Title	Course Code
21	Intellectual Property Rights (MBA)	16MB3121/16MB3221
22	Industrial Safety and Hazards (EEE)	16EE3122/16EE3222
23	JAVA Programming (CSE)	16CS3123/16CS3223
24	Electronic Measuring Instruments (ECE)	16EC3124/16EC3224
25	Nano Materials and Technology (ME)	16ME3125/16ME3225
26	Global Warming and Climate Change (CE)	16CE3126/16CE3226

Open Elective II

S. No.	Course Title	Course Code
31	Supply Chain Management (MBA)	16MB3231/16MB4131
32	Knowledge Management (CSE)	16CS3232/16CS4132
33	Energy Conservation and Management (EEE)	16EE3233/16EE4133
34	Basics of Communication Systems (ECE)	16EC3234/16EC4134
35	Manufacturing Processes (ME)	16ME3235/16ME4135
36	Building Technology (CE)	16CE3236/16CE4136

Open Elective III

S. No.	Course Title	Course Code
41	Banking and Insurance (MBA)	16MB3241/16MB4141
42	Database Systems (CSE)	16CS3242/16CS4142
43	Micro-electro-mechanical Systems (EEE)	16EE3243/16EE4143
44	Principles of Wireless Communication Systems (ECE)	16EC3244/16EC4144
45	Aspects of Heat Transfer in Electronically Controlled Units (ME)	16ME3245/16ME4145
46	Green Buildings (CE)	16CE3246/16CE4146
47	Foreign Language - French	16EN3247/16EN4147
48	Foreign Language -Spanish	16EN3248/16EN4148
49	Foreign Language -German	16EN3249/16EN4149

Open Elective IV

S. No.	Course Title	Course Code
51	Entrepreneurship (MBA)	16MB4251
52	Web Development (CSE)	16CS4252
53	Renewable Energy Sources (EEE)	16EE4253
54	Biomedical Instrumentation (ECE)	16EC4254
55	Materials Handling (ME)	16ME4255
56	Disaster Mitigation and Management (CE)	16CE4256
57	Actuarial Statistics (S&H)	16MA4257

Geethanjali College of Engineering and Technology

(Autonomous)

Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16EN1101 - ENGLISH-1

I Year B.Tech. (CSE, ECE, EEE, ME, CE) – I Sem

L	T	P/D	C
2	-	-/-	2

Prerequisite(s): None

Course Objectives

Develop ability to

1. Read well and speak grammatically correct English.
2. Become a good communicator, both written and oral.
3. Analyse, interpret the given data/text and infer appropriately.
4. Design an outline for a paragraph, essay, letters etc.
5. Listen actively and respond accordingly.
6. Apply classroom learning to conduct oneself in a multicultural environment.

Course Outcomes

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

CO1: Speak fluent, intelligible and grammatically correct English

CO2: Use language appropriately in various functional contexts

CO3: Analyse a given situation / text and interpret accordingly.

CO4: Write effectively in formal and informal situations

CO5: Acquire active listening skills and demonstrate the same.

CO6: Acquire the nuances of behavioural etiquette in a multicultural environment.

Syllabus:

Unit-1

Reading	*Tea Party by Ruth Prawer Jhabvala*
Vocabulary	Homonyms, Homophones Homographs
Grammar	Nouns and Articles, Types of Verbs
Speaking	Greeting people and taking leave, Introducing oneself and others
Writing	Writing sentences, Punctuation

Unit-2

Reading	*1)Risk Management* by Joe Crompton, *2)Sivakasi* by Amrutha Gayatri
Vocabulary	1)Synonyms, 2)Antonyms and Synonyms, Commonly misspelt words
Grammar	1)Subject-verb agreement, 2)The present tense

Speaking	Giving Directions
Writing	Paragraph Writing, Note making, Note taking

Unit-3

Reading	1) *Polymer Bank notes*, 2) *The one thing every business executive must understand about social media* by Kerpen
Vocabulary	1) Collocations, 2) Technical Vocabulary
Grammar	1) Past Tense & Future Tense, 2) Adjectives – Comparison, Prepositions
Speaking	1) Group Discussions, 2)Speaking on the telephone (Telephone Etiquette)
Writing	Information Transfer

Unit-4

Reading	1) *IF* by Rudyard Kipling, 2) *Courage and integrity are at the core of the successful leadership*
Vocabulary	1) Positive descriptive vocabulary, Common errors in English, 2)Idioms and Phrases
Grammar	1) Reported Speech, 2)Active voice & passive voice
Speaking	1) Talking about hypothetical situations, 2) Narrating experiences/events and expressing opinions
Writing	1) Letter Writing, 2)Phrasal Verbs, 3) Guided Composition

Unit-5

Reading	Study Skills
Vocabulary	Functional vocabulary related to writing and reading
Grammar	Picture Reading/ Interpretation
Writing	Job Application, Narrative, Reviews-articles/newspaper/books/movies, Essay/articles

Text Book:

Skills Annexe: Functional English for Success, Orient Longman

Reference Books

1. Contemporary English Grammar Structures and Composition by David Green, Macmillan Publishers 2010, New Delhi
2. Innovate with English: A course in English for Engineering students by T Samson, Foundation Books
3. English Grammar Practice by Raj N Bakshi, Orient Longman
4. Spoken English by R. K. Bansal and Harrison, Orient Longman
5. Technical Communication by Meenakshi Raman, Oxford University Press
6. Grammar Games by Renuvolcuri Mario, Cambridge University Press
7. Enrich Your English by Thakur K.B.P. Sinha, Vijay Nicole Imprints Pvt. Ltd.

Geethanjali College of Engineering and Technology

(Autonomous)

Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16PH1101 - ENGINEERING PHYSICS

I Year B Tech. ME, I Semester

L	T	P/D	C
3	1	-/-	3

Prerequisite(s): None

Course Objectives:

Develop ability to

1. Understand the fundamental aspects of crystal structures, various types of crystal defects and methods of determining the crystal structures using X- ray diffraction.
2. Distinguish different types of dielectric polarization mechanisms; understand the properties of different dielectric materials and their applications.
3. Demonstrate classification of magnetic materials; understand the phenomenon of superconductivity and the applications of magnetic materials and superconductors.
4. Understand the concepts of interference, diffraction, light amplification, working of various types of LASERs and their applications.
5. Outline the behaviour of materials at nanoscale, three methods of preparation of nanomaterials and their characterization techniques with applications.

Course Outcomes:

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

CO1: Explain the fundamentals of crystal structures; summarize various crystal defects and methods of determining the crystal structures using X-Rays.

CO2: Explain different types of dielectric polarization mechanisms, and the properties of different dielectric materials and their applications.

CO3: Explain different types of magnetic materials, phenomenon of superconductivity and applications of magnetic materials and superconductors.

CO4: Explain phenomena of interference, diffraction, and light amplification process, construction and working of Ruby, He-Ne, Semiconductor LASERs and their applications in different fields.

CO5: Illustrate awareness of sol-gel method, physical vapour deposition method and ball milling method for preparation of nanomaterials and their applications.

Syllabus:

UNIT I: C**rystallography and X-Ray diffraction**

Space lattice, unit cell, lattice parameters, crystal systems, Bravais lattices, atomic radius, coordination number and atomic packing factors of simple cubic, body centered cubic, face centered cubic, and diamond structure. Crystal directions & planes, Miller indices, inter planar spacing of orthogonal crystal systems.

Defects in crystal: Point defects, line defects (Qualitative Treatment). Estimation of Schottky and Frenkel defects, Burger's vector. Bragg's law, X-Ray diffraction- Laue method and powder method. Applications of X-Rays in different fields.

UNIT II: Dielectric properties

Electric dipole, dipole moment, dielectric constant, polarizability, electric susceptibility, displacement vector, electronic and ionic polarizations (Quantitative), orientation and space charge polarizations (qualitative). Internal fields in solids, Clausius-Mosotti equation, Piezo, Pyro & Ferro electricity and their applications.

UNIT III: Magnetic Properties

Permeability, field intensity, magnetic field induction, magnetization, magnetic susceptibility, origin of magnetic moment, Bohr magneton, classification of Dia, Para, Ferro, Antiferro and Ferri magnetic materials; domain theory of Ferro magnetism- Hysteresis curve, soft and hard magnetic materials, applications of magnetic materials. Basic concepts of superconductivity and properties of super conductors: Type –I, Type – II super conductors, BCS theory (Qualitative), applications of superconductors in science and engineering.

UNIT IV: Optics and LASERs

Introduction to interference, theory of interference in thin films, Newton's rings, anti reflection coatings; introduction to diffraction, diffraction due to single slit, double slit and diffraction grating. Lasers and their characteristics, stimulated absorption, spontaneous emission and stimulated emission, Einstein's coefficients and relation between them, pumping schemes, optical resonator, various types of Lasers: Ruby Laser, He-Ne Laser, Semiconductor Laser and applications of Lasers.

UNIT V: Nanoscience

Origin of Nanoscience, Nanoscale, classification of nanomaterials- surface to volume ratio, Quantum confinement, synthesis of nanomaterials – sol gel method, physical vapour deposition method, ball milling method; properties of nanomaterials, characterization of nanomaterials using Scanning Electron Microscope(SEM), Transmission Electron Microscope(TEM), Applications of nano-science in various fields.

TEXT BOOKS:

1. Engineering Physics, K. Malik, A. K. Singh, Tata McGraw Hill Book Publishers.
2. Engineering Physics, M N Avadhanulu, S Chand Publications

REFERENCES:

1. Introduction to Solid state physics by – Kittel, 8th Edition, John Weily Publishers.
2. Fundamentals of Physics, David Halliday, John Weily Publishers.
3. University Physics, Sear's and Zemansky (10th Edition), Wesly Publishers.
4. Applied Physics, PK Mittal, IK International Publishing house.
5. Engineering Physics, V. Rajendran, Tata Mc Graw Hill Book Publishers.

Geethanjali College of Engineering and Technology

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16MA1101 - MATHEMATICS-I

I Year B Tech. ME, I Semester

L	T	P/D	C
4	1	-/-	4

Prerequisite(s): None

Course Objectives

Develop ability to

1. Understand various types of Matrices, properties and rank of a matrix to find the solution for system of equations, if it exists.
2. Apply the knowledge of eigen values and eigen vectors of a matrix from quadratic form into a canonical form through linear and orthogonal transformations.
3. Identify the methods of solving the differential equations of first order and applications in engineering problems namely, Newton's law of cooling, Natural growth and decay.
4. Solve second and higher order differential equations and apply the same to electrical circuits and simple harmonic motion.
5. Analyse properties of Laplace Transform, Inverse Laplace Transform and convolution theorem and apply the same to solve ordinary differential equations.

Course Outcomes:

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

CO1: Write the matrix representation of a set of linear equations and analyse solutions of a system of equations.

CO2: Deduce eigen values and eigen vectors of a matrix and apply the same to reduce quadratic form into a canonical form through linear and orthogonal transformations.

CO3: Identify the type of differential equation and use the appropriate method to solve the same.

CO4: Apply differential equations to solve engineering problems particularly, electrical circuits and simple harmonic motion.

CO5: Solve ordinary differential equations of second and higher order using Laplace Transform techniques.

Syllabus:

UNIT-I: Theory of Matrices-I

Real matrices-symmetric, Skew-symmetric, Orthogonal, Complex matrices**:** Hermitian, Skew Hermitian, Unitary Matrices and Idempotent Matrix, Finding rank of a matrix by reducing to Echelon and Normal forms, Inverse of a non-singular matrix using row/column transformations (Gauss-Jordan method). Consistency of system of linear equations (homogeneous and non-homogeneous) uses the rank of a matrix, Solving mxn and nxn linear system of equations by Guass elimination.

UNIT- II: Theory of Matrices-II

Cayley-Hamilton Theorem(without proof)-Verification, Calculating inverse of a matrix and powers of a matrix by Cayley-Hamilton theorem, Linear dependence and Independence of Vectors, Linear Transformation-Orthogonal Transformation, Eigen values and eigenvectors of a matrix, Properties of eigen values and eigenvectors of real and complex matrices, Linearly independent eigenvectors of a matrix when the eigen values of the matrix are repeated, Quadratic forms up to three variable, Rank-Positive definite, negative definite, semi-definite, Index, signature of a quadratic form.

UNIT – III: First Order Ordinary Differential Equations

Differential equations- exact, linear and Bernoulli, Applications of first order differential equations-Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories. Electrical Circuits.

Unit-IV: Higher Order Ordinary Differential Equations

Linear, homogeneous and non-homogeneous differential equations of second and higher order with constant coefficients, Non homogeneous of the type e^{ax}, sin ax, cos ax and x^n, $e^{ax}V(x)$, $x^nV(x)$ and Method of variation of parameters, Applications of second order differential equations to Electrical circuits and simple harmonic motion.

UNIT-V: Laplace transforms

Definition of Laplace transform, domain of the function and Kernel for the Laplace transforms. Existence of Laplace transforms. Laplace transform of standard functions, first shifting theorem, Laplace transform of functions when they are multiplied or divided by "t". Laplace transforms of derivatives and integrals of functions-Unit step function-second shifting theorem-Dirac's delta function, Periodic function-Inverse Laplace transform by Partial fractions (Heaviside method), Inverse Laplace transforms of functions when they are multiplied or divided by "s". Inverse Laplace transforms of derivatives and integrals of functions, Convolution theorem-Applications to ordinary differential equations.

Text Books:

1. Advanced Engineering Mathematics by R.K. Jain and S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.
2. Advanced engineering Mathematics by Kreyszig, John Wiley and Sons Publishers.

Reference Books:

1. Higher Engineering Mathematics by B.S. Grewal, Khanna Publications.
2. Engineering Mathematics by Srimanta pal, subhodh C.Bhunia, Oxford higher Education.
3. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, CRC Press Taylor and Francis Group.
4. Mathematics for Engineers and Scientists, Alan Jeffrey, 6th Edi, 2013, Chapman & Hall/ CRC
5. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education.
6. Ordinary & Partial Differential Equations, M D Raisinghania, S. Chand.

Geethanjali College of Engineering and Technology

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16CS1102 – INTRODUCTION TO COMPUTER PROGRAMMING

I Year B Tech. CE/ME, I Semester

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course Objectives

Enable students to

1. Understanding the intricacies of program development and problem solving techniques using Raptor tool.
2. Understand the structure of a C-language Program, list, describe, classify the C data types, input and output concepts as they apply to programs in C.
3. Describe the expression types; understand the rules of precedence and associativity in evaluating the expressions.
4. Understand how a C program evaluates logical and repetitive (loop) statements.
5. Describe the importance of modularity and design multi-function programs.
6. Understand the basic concepts and uses of arrays using C-Language Program.
7. Understand the concept and use of pointers for memory management techniques.

Course Outcomes

After completion of the course, student would be able to

CO1. Demonstrate problem solving skills by developing algorithms to solve problems using Raptor tool.

CO2. Incorporate the concept of variables, constants and basic data types in a C language program.

CO3. Use simple input and output statements in a C Language Program.

CO4. Incorporate the use of sequential, selection and repetition control statements into the algorithms implemented as computer programs using C language.

CO5. Demonstrate an understanding of structured design by implementing programs with functions and passing of parameters to solve more complex problems.

CO6. Implement C programs using arrays.

CO7. Write and execute programs that access and manage data through pointers.

Syllabus:

UNIT – I: Basics of Computers

Logic Building: Flow chart, Algorithm, Pseudo code. Introduction to Raptor Programming Tool

Introduction to Programming – Computer Languages, Creating and running programs, Program Development.

Introduction to the C Language – Background, C Programs, Identifiers, Data Types, Variables, Constants, Input/output functions.

Operators - Arithmetic, relational, logical, bitwise, conditional, increment/decrement, assignment etc.., C program examples. Expressions, Precedence and Associativity, Expression Evaluation, type conversions.

UNIT – II: Statements- Selection Statements (decision making) – if and switch statements with Raptor Tool, and C program examples.

Repetition statements (loops) - while, for, do-while statements with Raptor Tool, and C Program examples

Statements related to looping – break, continue, goto, Simple C Program examples.

UNIT – III: Functions-Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, C program examples.

Recursion- recursive functions, Limitations of recursion, example C programs

UNIT –IV: Arrays – Concepts, using arrays in C, arrays and functions, array applications, two – dimensional arrays, multidimensional arrays, C program examples.

UNIT – V: Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, void pointer, null pointer.

Pointer Applications - Arrays and Pointers, Pointer Arithmetic and arrays, passing an array to a function.

Memory allocation functions – malloc(), calloc(), realloc(), free(), Array of pointers, pointers to functions, C program examples.

Text Books

1. Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R.F. Gilberg, Third Edition, Thomson Learning, 2007 Reprint.

Reference Books

1. Raptor-A flow charting Tool http://raptor.martincarlisle.com
2. The C Programming Language, B.W. Kernighan and Dennis M. Ritchie, PHI.
3. Programming in C. P. Dey and M Ghosh, Oxford University Press.
4. Programming with C, B. Gottfried, 3rd edition, Schaum's outlines, TMH.
5. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7th Edition, Pearson education.

Geethanjali College of Engineering and Technology

(Autonomous)

Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16ME1102 - ENGINEERING MECHANICS-I

(CE and ME)

I Year B Tech. ME, I Semester

L	T	P/D	C
2	1	-/-	2

Prerequisite(s): None

Course Objectives:

Develop ability to

1. Understand basic terms and representation of forces and simplify any force system using free body diagram.
2. Accurately draw free body diagrams for determining internal forces and their reactions on various structures.
3. Apply equilibrium equations to solve problems comprising frictional forces.
4. Determine centroid, first moment of inertia and second moment of inertia of various structures.

Course Outcomes (COs)

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

CO1: Describe position, forces, and moments in terms of vector notation in two and three dimensions.

CO2: Draw free body diagrams accurately and write appropriate equilibrium equations from the free body diagram, including support reactions.

CO3: Apply concepts of equilibrium to analyse systems that include frictional forces.

CO4: Calculate moments, centroids, and centres of mass for discrete particles: a body of arbitrary shape and a body having axial symmetry corresponding moments of Inertia.

Syllabus:

Unit-I

Introductory concepts: Scope of mechanics, preview in statics and dynamics, fundamental concepts, scalar and vector quantities, Newton laws.

Resultants of force system: Introduction, Parallelogram Law, force and components, Resultant of coplanar concurrent forces, Moment of force and principles of moments, varignons theorem, couple and moment of couple, Resultant of any force system, Components of forces in space, Spatial forces and its applications.

Unit-II

Equilibrium of force system: Introduction, free-body diagram, Equations of Equilibrium, Equilibrium of planar system, equilibrium of spatial systems.

Unit-III

Friction: Introduction, Theory of friction, Angle of friction, Laws of friction, cone of friction, block friction.

Friction: ladder friction, wedge friction.

Unit-IV

Centroids and Center of Gravity: Introduction, Center of gravity of flat plate, Centroid of areas and lines, importance of Centroids and moment of area, Centroids of composite figures, Theorems of pappus.

Unit-V

Moments of Inertia: Definition of moment of inertia, Polar moment of inertia, Radius of gyration, Transfer formula for moment of inertia, Moments of inertia for composite bodies, Product of inertia, Transfer formula for product of inertia, Mass moment of inertia.

Text Books:

1. Engineering Mechanics, Ferdinand. L. Singer, (1998), Harper – Collins publishers, New Delhi.
2. Engineering Mechanics, S.S. Bhavikati& J.G. Rajasekharappa, (2012), New Age International, India.

Reference Books:

1. Engineering Mechanics, Timoshenko & Young (2007), McGraw Hill, India.
2. Engineering Mechanics, A.R. Tayal (2009), Umesh Publications, New Delhi.
3. Engineering Mechanics, R.S. Khurmi (2009), S. Chand & Company Limited, New Delhi.
4. Engineering Mechanics, K.L Kumar (2009), Tata McGraw Hill, New Delhi.
5. Engineering Mechanics, Irving. H. Shames (1999), Prentice-Hall, India.

Geethanjali College of Engineering and Technology

(Autonomous)

Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16ME1101 - ENGINEERING DRAWING

I Year B Tech. ME, I Semester

L	T	P/D	C
2	-	-/3	4

Prerequisite(s): None

Course Objectives

Develop ability to

1. Visualize and communicate all engineering elements and understand various concepts such as dimensions, conventions and standards related to working drawings.
2. Understand the fundamentals of geometrical curves and their applications in engineering.
3. Visualize different positions of planes and solids.
4. Visualize various isometric views and their applications in engineering.
5. Understand multi-view representations and their conversion into pictorial views and vice versa.

Course Outcomes (COs)

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

CO1: Visualize and communicate all engineering elements and represent the same using standard dimensions and conventions related to working drawings used in engineering practice.

CO2: Comprehend concepts of all 2D elements such as Conic Sections and 3D Objects namely, Prisms, Cylinders, Pyramids and Cones.

CO3: Draw orthographic projections of straight lines, planes and solids of given engineering components.

CO4: Construct isometric scale, isometric projections and views of given engineering components.

CO**5:** Visualize multi-view representations and its conversion into pictorial views and vice versa.

Syllabus:

Unit-I: Introduction to engineering drawing & Importance of engineering drawing:

Principles of Engineering Drawing, Various Drawing Instruments., Lettering and dimensioning, BIS standards, Title block, Geometrical constructions, Bisecting a line, arc and angle, Dividing straight line in to equal number of parts, Tangents to circles and arcs, Construction of pentagon, hexagon, inscribing circles inside regular polygons and vice versa etc.,

Constructions of curves used in engineering practice:

Conic sections including rectangular hyperbola - **General method only.**

Cycloids and Involutes.

Scales: Construction of different types of scales - Plain scale, Diagonal scale, vernier scale

Unit-II: Introduction to Orthographic projections: conventions-first and third angle projections.

Projections of points: in all four quadrants.

Projections of straight lines: line in simple position, line inclined to one plane and parallel to other planes, Line inclined to both the planes.

Unit-III: Projections of planes: planes in simple position, plane inclined to one plane and perpendicular to other plane, plane inclined to both the planes.

Projections of solids (Cube, tetrahedron, Cone, Cylinder, Regular Prisms and Pyramids): solids in simple position (Axis perpendicular to one plane)

UNIT-IV: Isometric projections: Principle of isometric projection - isometric scale - isometric views - conventions - plane figures. Simple and compound solids - isometric projection of objects having non-isometric lines.

Unit-V: Transformation of projections: conversion of Isometric views to orthographic views. Conversion of orthographic views to Isometric views - simple objects.

Text Books:

1. Engineering Drawing- N.D. Bhatt/Charotar publications/50th edition
2. Engineering Drawing- Basant Agrawal/TMH/2nd edition,2013

References:

1. Engineering Graphics- P I Varghese/Tata McGraw Hill Education Pvt. Ltd/1st edition
2. Engineering Graphics- P.J. Shah/S. Chand Publishers/2014
3. Engineering Drawing- M.B. Shah and B.C. Rana/Pearson/2nd edition
4 Engineering Drawing- K. Venu Gopal and V. Prabu Raja/ New Age Publications/11th edition
5. Engineering Graphics-Frederick E Giesecke/Peachpit Press/8th edition, 2003

Geethanjali College of Engineering and Technology

(Autonomous)

Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16PH11L1 - ENGINEERING PHYSICS LAB

(CE & ME)

I Year B Tech. ME, I Semester

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): None

(Any ten of the following twelve experiments compulsory)

Course Objectives:

Develop ability to

1. Determine modulii of elasticity; measure moment of inertia of a fly wheel; evaluate coupling constant and the frequency of A.C signal.
2. Determine the dispersive power of glass, wavelength of spectral lines in mercury spectrum, wavelength of LASER and radius of curvature of plano-convex lens.
3. Determine the magnetic induction at several points on the axis of coil carrying current using Stewart and Gee's method, time constant of a capacitor and the resonant frequency and quality factor of a LCR circuit.
4. Determine the energy gap of a given semiconductor; plot the V-I characteristics of solar cell.

Course Outcomes:

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

CO1: Infer modulii of elasticity of a given material, compute shearing stress and strain: identify their limitations, deduce the moment of inertia of a body and explain its concept.

CO2: Explain the concept of conservation of energy through determination of coupling constant. Compute the frequency of an A.C. signal using sonometer.

CO3: Demonstrate the optical phenomena like dispersion, interference and diffraction.

CO4: Compute the magnetic induction using Stewart and Gee's method. Explain the signal delay in electronic circuits by calculating time constant of a capacitor. Compute the resonant frequency and quality factor of a LCR circuit.

CO5: Calculate energy gap of a given semiconductor. Obtain the V-I characteristics of solar cells and specify their applications.

List of Experiments:

1. Determination of Rigidity Modulus of a given wire using Torsional Pendulum.
2. Determination of Young's Modulus of the material of a beam- Cantilever-Uniform bending.
3. Determination of moment of inertia of a Fly Wheel.
4. Coupled oscillator – Determination of coupling constant.

5. Frequency of a.c. supply – Sonometer method (Using electromagnet).
6. Determination of Dispersive Power of the material of a Prism –Spectrometer.
7. Determination of radius of curvature of a given Plano Convex lens by forming Newton's Rings.
8. Determination of wavelength of spectral lines of mercury spectrum - Diffraction grating.
9. Determination of Wavelength of a given source of LASER - Diffraction Grating.
10. Determination of magnetic field of induction at several points on the axis of coil carrying current using Stewart and Gee's method.
11. Time constant of the given RC combination.
12. Study the frequency response of LCR series circuit and to find the resonant frequency and quality factor.

Additional Experiments:

1. V-I characteristics of a Solar cell.

2. Determination of Energy gap of a given semiconductor.

Geethanjali College of Engineering and Technology

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16CS11L2 – COMPUTER PROGRAMMING LAB

I Year B.Tech. CE/CSE/ECE/EEE/ME – I Sem

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): None

Course Objectives

Enable students to

1. Understand the intricacies of program development and problem solving techniques using Raptor tool.
2. Understand the structure of a C-language Program, list, describe, classify the C data types, input and output concepts as they apply to programs in C.
3. Describe the expression types; understand the rules of precedence and associativity in evaluating the expressions.
4. Understand how a C program evaluates logical and repetitive (loop) statements.
5. Describe the importance of modularity and design multi-function programs.
6. Understand the basic concepts and uses of arrays using C-Language Program.
7. Understand the concept and use of pointers for memory management techniques.

Course Outcomes

After completion of the course, student would be able to

CO1. Demonstrate problem solving skills by developing algorithms to solve problems using Raptor tool.

CO2. Incorporate the concept of variables, constants and basic data types in a C language program.

CO3. Use simple input and output statements in a C Language Program.

CO4. Incorporate the use of sequential, selection and repetition control statements into the algorithms implemented as computer programs using C language.

CO5. Demonstrate an understanding of structured design by implementing programs with functions and passing of parameters to solve more complex problems.

CO6. Implement C programs using arrays.

CO7. Write and execute programs that access and manage data through pointers.

S.No	Name of the program
1.	Introduction to RAPTOR Tool, Draw Flow chart using RAPTOR for, a. Read a number and Display the same number b. Read and Display the student details c. Read two numbers from user and calculate addition and subtraction of those numbers d. Read two numbers from user at the time of execution and calculate multiplication and division of those numbers e. Find the square of a given number (take the number from the user) f. Calculate the value of Y from the equation $y = x^2 + 2x + 3$ (read the value of X from user)
2.	Draw Flow chart using RAPTOR for, 1. Calculate the area of a Circle 2. Calculate the area of a Square 3. Calculate the area of a Rectangle 4. Interchange two numbers 5. Find the sum of square of two numbers 6. Convert Centigrade to Fahrenheit 7. Convert Radius to Degrees 8. Display the roots of Quadratic Equation
3	Draw Flow chart using RAPTOR for, a. Check the given number is Positive or Negative b. Check the given number is even or odd c. Display whether a person is eligible for vote or not d. Calculate the Largest of two numbers e. Check the given year is leap year or not f. Check whether two numbers are equal or not g. Find the largest value among three given numbers
4	Draw Flow chart using RAPTOR for, a. Calculate and display the grade of a student < 30 % - Fail b. Between 31 and 50 – C grade c. Between 51 to 60 – B grade d. Between 61 to 75 – A grade e. Greater than 75 - distinction b. Find the quadratic roots of an equation (real or imaginary) c. Check the given number is multiple of 2,4and 8
5	Draw Flow chart using RAPTOR for, a. Display n numbers using looping b. Calculate the sum of n natural numbers c. Display the even numbers below n d. Calculate sum of even numbers and odd numbers from 1 to n (n value supplied by the user)
6	a. Write a C program to display student details b. Write a C program to perform arithmetic operations c. Write a C program to implement increment and decrement operators d. Write a C program to implement conditional operator

	e. Write a C program to implement bit wise operator
7	a. Write a C program to calculate the biggest of given two numbers b. Write a C Program to print the result depending on the following 1. < 30 % - Fail 2. Between 31 and 50 – C grade 3. Between 51 to 60 – B grade 4. Between 61 to 75 – A grade c. Write a C Program to implement arithmetic calculator using switch case
8	a. Write a C program to find sum of n natural numbers b. Write a C program to find individual digits of the given number c. Write a C program to find factorial of a given number
9	a. Write a C program to display the prime numbers below n (where n value is given by user) b. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence. c. Write a C program to find the quadratic roots of an equations d. Write a c program to calculate sum of the following geometric equation Sum=$1+x+x^2+x^3+\ldots..+x^n$
10	a. Write a C program to find the given number is palindrome or not b. Write a C program to find GCD and LCM of two given numbers using functions c. Write a C program to find the factorial of a given number using recursive function d. Write a C program to generate the fibonacci series using recursive function
11	a. Write a c program to find largest and smallest numbers in a list of array elements using functions b. Write a C program to sort the given list of elements in ascending order using functions. c. Write a c program to search for a given element in the list of array and display the "location" if the number is found else print "the number is not found". 1. Using fixed length array 2. Using variable length array.
12	a. Find the duplicate elements in the list of sorted array b. Write a C program that uses functions to perform the Addition of Two Matrices c. Write a C program that uses functions to perform the Multiplication of Two Matrices
13	a. write a C program to swap two integers using following methods 1. call by value 2. call by reference b. Write a C program to find sum of even and odd numbers using functions and pointers
14	a. Write a C program to find Largest Number Using Dynamic Memory Allocation. b. Write a C program to return multiples values from a function using pointers

Geethanjali College of Engineering and Technology

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16WS11L1 - ENGINEERING WORKSHOP and IT WORKSHOP

I Year B Tech. ME, I Semester

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): None

Course Objectives:

Develop ability to

1. Inculcate general machining skills.
2. Understand the dignity of labour, precision, safety at work place, team working and development of positive attitude.
3. Gain hands on experience on different trades of engineering such as fitting, carpentry, tin smithy, welding, foundry, black smithy, house wiring and sheet metal.
4. Acquire knowledge of thread cutting and pipe joining in plumbing.
5. Understand the concept of Machining with lathes and automats.
6. Understand of power tools used in various Engineering applications.

Course Outcomes (COs)

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

CO1: Use various modern engineering tools for engineering practice

CO2: Recognize dignity of labour and workshop safety regulations.

CO3: Design and model different prototypes in carpentry such as T-Lap Joint and L-Lap Joint.

CO4: Make basic prototypes in Tin Smithy such as Open Scoop and Rectangular Tray.

CO5: Perform basic House Wiring techniques such as Series wiring, Staircase (one lamp with two switches) Connection, Connecting one lamp with one switch, connecting two lamps with one switch.

CO6: Design and model basic prototypes in fitting such as L-Fitting, V-Fitting and Dove tail Fitting.

CO7: Make basic prototypes in Black Smithy such as S-Hook, C –Hook and Flat Chisel.

CO8: Perform basic Foundry such as Dumbbell Pattern, Stepped Pulley Pattern and Gear Pattern

CO9**:** Demonstrate knowledge of welding process, Plumbing and power Tools.

List of Experiments

I. Trades for Exercises:

At least TWO exercises from each trade:

1. **Carpentry:** T-Lap Joint, L-Lap Joint, Cross Lap joint, Dove Tail Joint
2. **Fitting:** L-Fitting, V-Fitting, Dove tail Fitting.
3. **Tin-Smithy:** Open Scoop, Rectangular Tray, Funnel and development of jobs carried out and soldering.
4. **House-Wiring:** Series Wiring, Staircase Wiring, Connecting one lamp with one switch, connecting two lamps with one switch.
5. **Black Smithy:** S-Hook, C –Hook, Flat Chisel.
6. **Foundry:** Dumbell Pattern, Stepped Pulley Pattern, Gear pattern

II. Trades for Demonstration and Exposure:

1. **Welding:** V-Butt Joint, Corner Butt Joint, Lap Joints.
2. Power tools used in construction, wood working, electrical engineering and mechanical engineering.
3. **Plumbing:** Thread Cutting, Pipe Joining –1, Pipe Joining -2.

Text Books:

1. Work shop manual - P. Kannaiah/K.L Narayana, SciTech publishers.
2. Workshop manual by Venkat Reddy, 2nd Edition, SciTech publishers.
3. Mechanical Workshop Practice. John K.C., 2nd Edition. PHI, 2010.

References:

1. Workshop Technology Vol. I & II, Raghuwanshi B.S., Dhanpath Rai and Sons.
2. Workshop Manual, Kannaiah P. and Narayana K.L., 2nd Edition, SciTech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edition, PHI, 2010.
4. Jeyapoovan T. and Pranitha S, Engineering Practices Lab Manual, 3rd Edition, Vikas, Publishers, 2008.

IT WORKSHOP

Prerequisite(s): None

Enable students to

1. Identify different components of Personal Computer (PC) and their configurations.
2. Identify various steps for disassembly and assembly of PC components.
3. Install Windows and Linux operating systems on Personal Computers.
4. Troubleshoot simple hardware and software related problems.
5. Make Text Documents using various features of document preparation tools such as MS-Word, Libre Office Write, LaTex.
6. Make Spread Sheet using various features of worksheet preparation tools namely, MS-Excel, Libre Office Calc.
7. Make Presentations using various features of presentation tools namely, MS-Power point, Libre Office Express.

Course Outcomes

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

CO1. Identify the components of Personal Computer (PC) System.

CO2. Disassemble and assemble the components of Personal Computer.

CO3. Troubleshoot trivial hardware and software related problems.

CO4. Use productivity software such as MS Office Tools: Word, Excel, Power Point, Libre Office Tools: Write, Calc, Express and LaTex.

CO5. Install Operating Systems such as Windows and Linux on personal computers

Week 1	**Task 1**: Different generations of computers, computing environments, Identify the peripherals of a computer, components in CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral. **Task 2**: The students need to go through the video which shows the process of assembling a PC. The student should disassemble and assemble the PC back to its working condition.
Week 2	**Task 1:** Every student should learn installing Windows-7 in the personal computer. **Task 2:** Hardware & software Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals and Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.
Week 3	**Task**: Every student should learn the process of installing Linux in the computer along with configuring as dual boot with both windows and Linux.
Week 4	**Task 1**: Features of Word Processor Tool: Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track changes. **Task 2**: Creating a Newsletter: Features: Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge.
Week 5	**Task 1**: Features of Spreadsheet Tool: Creating a Scheduler - Features:- Gridlines, Format Cells, Summation, auto fill, Formatting Text **Task 2**: Calculating GPA : Cell Referencing, Formulae in spreadsheet – average, std.

	deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, lookup, Sorting, Conditional formatting.
Week 6	**Task**: Features of Presentation tool: Students will work on basic power point utilities and tools which help them to create power point presentation. Presentation Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Hyperlinks, Inserting – Images, Clip Art, Audio, Video, Objects, Tables and Charts Lines and Arrows.
Week 7	**Task:** Document preparation using LaTex
Week 8	**Task:** Document, Spreadsheet and Presentation using Libre Office

Text Book(S)

1. Comdex Information Technology Course Tool Kit, Vikas Gupta, WILEY Dreamtech.
2. Introduction to Information Technology, ITL Education Solutions Limited, Pearson Education.

Reference Book(S)

1. Introduction to Computers, Peter Norton, 6/e McGraw Hill Publishers.
2. LaTex Companion, Leslie Lamport, PHI/ Pearson.
3. Upgrading and Repairing, PC's 18th e, Scott Muller QUE, Pearson Education.
4. IT Essentials PC Hardware and Software Companion Guide, Third Edition, David Anfinson and Ken Quamme, CISCO Press, Pearson Education.

Geethanjali College of Engineering and Technology

(Autonomous)

Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16EN1201 - ENGLISH- II

I Year. B.Tech. (CSE, ECE, EEE, ME, CE) – II Sem

L	T	P/D	C
2	-	-/-	2

Prerequisite(s): 16EN1101– English- I

Course Objectives

Develop ability to

1. Function in multidisciplinary teams.
2. Understand professional and ethical responsibility.
3. Apply strategies and inculcate life skills.

Course Outcomes

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

CO1: Acquire interpersonal and life skills

CO2: Demonstrate professional ethics and etiquette

CO3**:** Demonstrate application of various strategies to real-life situations.

Syllabus:

Unit-1

Writing	Steps in Writing Process Cover letter and Job Application, Letter, Curriculum Vitae, Résumé, Abstract, Writing and Responding to a blog

Unit-2

Reading	*1)MokshagundamVisvesvaraya*, 2) *The Palm Islands*
Vocabulary	Prefixes and Suffixes
Grammar	Joining ideas using conjunctions, Adverbs
Speaking	Opinion-based questions
Writing	Summarizing

Unit-3

Reading	*1)Leela's Friend* by R.K.Narayan, 2)*Forensic Science*
Vocabulary	Guessing the words, Using the Appropriate word, Phrasal verbs
Grammar	Knowing with questions
Speaking	Presentation
Writing	Report Writing

Unit-4

Reading	1)*The Last Leaf* by O.Henry, 2)*Chose how to start your day*
Vocabulary	Idioms
Grammar	Relating objects by using prepositions, Ergative verbs
Speaking	Creative Speaking Activity
Writing	Technical Report Writing

Unit-5

Reading	1)*Indian Crowds* by Nirad C.Chaudhuri, 2)*Snippets that focus on cultural differences among the people*
Vocabulary	One-Word Substitutes (related to the lesson)
Grammar	Synthesis of Sentences
Speaking	Activity on Indo-American Cultural Differences
Writing	Day to day-experiences of students while travelling

Text Books

Epitome of Wisdom published by Orient Longman

A Passage to England by Nirad C. Chaudhuri

Recommended Books

1. Contemporary English Grammar Structures and Composition by David Green, Macmillan Publishers 2010, New Delhi
2. Innovate with English: A Course in English for Engineering Students by T Samson, Foundation Books
3. English Grammar Practice by Raj N Bakshi, Orient Longman
4. English Pronunciation in Use by Hancock, M. 2009, Cambridge University Press
5. Technical Communication by Meenakshi Raman, Oxford University Press
6. Grammar Games by Renuvolcuri Mario, Cambridge University Press
7. Enrich Your English by Thakur K.B.P. Sinha, Vijay Nicole Imprints Pvt.Ltd

Geethanjali College of Engineering and Technology

(Autonomous)

Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16PH1203 - PHYSICS FOR ENGINEERS

(CE and ME)

I Year B Tech. ME, II Semester

L	T	P/D	C
3	1	-/-	3

Prerequisite(s):**16PH1101 Engineering Physics**

Course Objectives

Develop ability to

1. Understand principle of sound propagation, basic requirements of a good auditorium, noise control in machines and automobiles, different methods of production of Ultrasonic waves and their applications.
2. Discuss the rotatory motion of rigid bodies; understand the concept of moment of inertia and its significance in rotatory motion, various types of modulii of elasticity.
3. Distinguish types of frictions, understand various principles involved in fluid motion, understand the concept of viscosity, and methods of production and measurement of low pressure.
4. Discuss the formation of energy bands in solids, classification of solids, and find the carrier concentration in intrinsic semiconductor, understand the concept of Fermi level and Hall Effect.
5. Understand the principle of optical fiber communication; distinguish various types of optical fibers and their applications.

Course Outcomes:

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

CO 1: Explain the basic requirements of a good auditorium, noise control of machines and automobiles, outline methods of production and applications of ultrasonics.

CO 2: Explain concepts of moment of inertia, torque, importance of rotatory motion of rigid bodies and the methods of determining elastic modulii of different materials.

CO 3: Interpret principles of fluid motion; explain viscosity of lubricants, production and measurements of low pressure.

CO 4: Distinguish between conductors, semiconductors and insulators; find the carrier concentration in intrinsic semiconductor and identify the type of extrinsic semiconductor through Hall Effect.

CO 5: Explain modes of propagation, attenuation in optical fibers and the applications of optical fibers in communication, sensors and detectors.

Syllabus:

UNIT I: Acoustics of buildings and Ultrasonics

Acoustics of buildings: Reverberation time, Sabine's formula, measurement of absorption coefficient of material, factors affecting the architectural acoustics and their remedies, acoustic quieting. Noise control in machines and auto mobiles- mufflers.

Ultrasonics: Introduction to ultrasonics, production of ultrasonic waves, magnetostriction method and piezoelectric method (principle, construction and working), properties of ultrasonics, detection of ultrasonics, applications of ultrasonics.

UNIT II: Dynamics of Rigid bodies

Angular momentum, angular acceleration, moment of inertia and its significance. Rotational kinetic energy, torque, work done by a torque, concept of torsional oscillations, torsional pendulum, KE of a rolling body on horizontal plane, rolling body on inclined plane, Moment of Inertia of a fly wheel and its applications. Modulii of elasticity, Poisson's ratio, beam-bending moment- cantilever- uniform and non uniform bending.

UNIT III: Friction, Wear and Fluid motion

Surface irregularities, sliding friction – rolling friction – effects of frictional heat – wear – mechanism of lubrication – various types of lubrication (qualitative treatment)

Turbulent and streamline motion, rate of flow, equation of continuity, Bernoulli's theorem, practical applications- Venturimeter, Torricelli's theorem.

Viscosity**:** Poiseuille's method, Ostwald's Viscometer, production and measurement of low pressures, rotary oil pump and diffusion pump, Pirani and Penning Guage.

UNIT IV: Band theory of solids and semiconductors:

Electron in a periodic Potential, Bloch theorem, Kronig-Penny Model (Qualitative Treatment), Brillouin Zones (E-K curve),origin of energy band formation in solids, concept of effective mass of an electron, classification of materials into conductors, semiconductors & insulators.

Classification of semiconductors- n-type, p-type, Fermi level in Intrinsic and Extrinsic semiconductors, Variation of Fermi level with temperature and concentration of dopants in extrinsic semiconductors, calculation of carrier concentration in intrinsic semiconductor(Quantitative treatment),carrier concentration in Extrinsic Semiconductors (Qualitative treatment), direct and indirect band gap semiconductors, Hall effect.

UNIT V: Fiber optics

Principle of optical fiber, construction of an optical fiber, acceptance angle and acceptance cone, numerical aperture, Types of optical fibers, modes of propagation, attenuation in optical fibers, Block diagram of optical fiber communication system, applications of optical fibers in sensors and detectors (displacement, smoke and liquid level detectors).

Text Books:

1. Strength of Materials, R. S. Khurmi & Gupta S. Chand publications.
2. A Text Book of Engineering Physics, M. N. Avadhanulu, S. Chand publications.

References:

1. Elements of properties of matter mechanics, D.S. Mathur, S. Chand publications.
2. A textbook of Engineering Mechanics, R.K. Bansal, Laxmi Publications.
3. Engineering Mechanics, S Timoshenko, K H Young, J V Rao, Sukumar Pati, Tata McGraw Hill publications.
4. Properties of Matter, Brijlal and Subramanyam, S. Chand publications.
5. Engineering Mechanics, K.L. Kumar, Tata McGraw Hill publications.

Geethanjali College of Engineering and Technology

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16MA1201 - MATHEMATICS-II

I Year B Tech. ME, II Semester

L	T	P/D	C
3	1	-/-	3

Prerequisite(s):**16MA1101 Mathematics-I**

Course Objectives

Develop ability to

1. Identify the methods of differential calculus to optimize single and multivariable functions.
2. Evaluate improper integrals using Beta and Gamma functions.
3. Evaluate multiple integrals and apply the same to solve engineering problems.
4. Understand convergence of the series using Fourier series technique and to find solution of integral equations using Fourier Transforms.
5. Explain properties of vector operators. Use vector calculus to determine the length of a curve, area between surfaces and volume of solids.

Course Outcomes:

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

CO1: Apply the methods of differential calculus to optimize single and multivariable functions.

CO2: Evaluate improper integrals using Beta and Gamma functions.

CO3: Evaluate multiple integrals and apply the concepts of the same to find areas, volumes and moment of inertia of regions on a plane or in space.

CO4: Apply Fourier series to find convergence of series and Fourier Transforms to solve integral equations.

CO5: Apply vector operators on scalar and vector point functions to compute length of a curve, area between surfaces and volume of solids, using vector calculus.

Syllabus:

UNIT-I: Functions of Several Variables

Limit, Continuity, Partial Differentiation, Total Derivatives, Functions of several variables- Functional dependence- Jacobian- Maxima and Minima of functions of two variables without constraints and with constraints-Method of Lagrange multipliers

UNIT-II: Improper Integration

Gamma and Beta Functions –Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions.

UNIT-III: Multiple Integration and its Applications

Multiple integrals – double and triple integrals – change of order of integration- change of variables (polar, cylindrical and spherical), Finding the area of a region using double integration and volume of a region in space using triple integration.

UNIT – IV: Fourier series and Transforms

Definition of periodic function, Fourier expansion of periodic functions in a given interval of length 2π. Determination of Fourier coefficients–Fourier series of even and odd functions–Fourier series in an arbitrary interval –even and odd periodic continuation – Half-range Fourier sine and cosine expansions, Fourier integral theorem –Fourier sine and cosine integrals, Fourier Integral transforms–Fourier sine and cosine transforms and their properties–inverse transforms–Finite Fourier transforms

UNIT –V: Vector Calculus

Scalar point function and vector point function, Gradient- Divergence- Curl and their related properties, - Laplacian operator- Solenoidal and irrotational vectors, Scalar Potential function, directional derivatives. Line integral – work done – Surface integrals -Volume integral. Green's theorem, Stoke's theorem and Gauss's Divergence theorems (Statement & their Verification).

Text Books:

1. Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.
2. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa publishing House, Delhi.

Reference Books:

1. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.
2. Engineering Mathematics by Srimanta pal, subhodhC.Bhunia, Oxford higher Education.
3. Mathematics for Engineers and Scientists, Alan Jeffrey, 6th Edition, 2013, Chapman & Hall/ CRC
4. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education
5. Ordinary & Partial Differential Equations, M D Raisinghania, S. Chand.

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16CH1201 - ENGINEERING CHEMISTRY

(ME and CE)

I Year B Tech. ME, II Semester

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None

Course Objectives

Develop ability to

1. Define and understand various conductances in electrochemistry, functional working of electrodes, different types of batteries and cells along with their applications.
2. Understand the concept of corrosion; distinguish various types of corrosion and prevention.
3. Identify the causes of hardness in water and its treatment using various techniques.
4. Classify polymers and their applications, understand different mechanisms of polymerization and understand different fibers along with their applications.
5. Understand the engineering materials namely, cement, lubricants, ceramics and glass.
6. Understand various adsorption techniques and its applications.

Course Outcomes (COs)

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

CO1: Explain

a. Various conductances in electrochemistry.

b. Functional working of electrodes.

c. Construction and working of different types of batteries and cells along with their functional differences and applications.

CO2: Explain corrosion and causes of corrosion, distinguish various types of corrosion and explain various methods to prevent the corrosion.

CO3: Explain hardness in water and various techniques used to treat the same.

CO4: Distinguish clearly various polymers and various synthetic and natural fibers; explain various polymerisation processes.

CO5**:** Explain the properties of various materials namely, cement, lubricants, ceramics, glass and their applications.

CO6: Explain various adsorption techniques and applications.

Syllabus

UNIT I: Electrochemistry and Batteries

Electro Chemistry: Conductance -Specific, Equivalent and Molar, their Units;

EMF: Galvanic Cell; types of Electrodes: Calomel, Quinhydrone and Glass; Nernst equation and its applications; Concentration cells, determination of pH using glass electrode-Numerical problems.

Batteries: Introduction, types of batteries: Primary cells and secondary cells, differences between them with examples.

Fuel Cells: Hydrogen–Oxygen fuel cell; applications of fuel cells.

UNIT II: Corrosion and its Control Methods

Corrosion: Introduction, definition, Types of Corrosion and disadvantages of corrosion. Mechanism of corrosion- chemical and electrochemical corrosion. Factors affecting rate of corrosion– Nature of metal and Nature of Environment –Electrochemical series and its applications, Corrosion control methods–Cathodic protection (sacrificial anodic and impressed current).

Surface Coatings: Metallic coatings & methods of application of metallic coatings –hot dipping (galvanization & tinning), Electro plating (Copper plating) and Electro less plating (Ni plating) – **Organic Coatings:** Paints-constituents and their functions.

UNIT III: Water and its Treatment

Hardness of Water: Types of hardness-temporary and permanent, units and interrelation between them. Boiler troubles–Scale & sludge, Priming and foaming, Caustic embrittlement- Treatment of boiler feed water–Internal treatment (Colloidal and Calgon conditioning)–External treatment–Zeolite process, ion exchange process. Potable water-Steps involved in treatment of potable water–Disinfecting water by chlorination and ozonisation –Reverse Osmosis & its significance.

UNIT IV: Polymers

Introduction: Classification of polymers, Types of Polymerization–addition and condensation, differences between addition and condensation polymers, Mechanism of free radical addition polymerization.

Plastics: Thermoplastic &Thermosetting resins, differences between thermoplastic and thermosetting polymers. Preparation, properties and engineering applications of PVC, Teflon and Bakelite.

Fibers: Introduction, types- natural and synthetic**.** Preparation, properties and uses of Nylon–6, 6, Nylon 6, 10. Fiber Reinforced Plastic (FRP) –Carbon fiber reinforced plastic and applications.

UNIT V: Materials and Surface Chemistry

A) Materials Chemistry

Cement: Introduction, Types of Cement, setting and hardening of Port land cement, Reinforced Concrete

Lubricants: Characteristics of good lubricant, properties– flash and fire, cloud and pour point and their significance, Nano Fabricated Lubricants.

Ceramics: Advanced Ceramics.

Glass: Reinforced glass material.

B) Surface Chemistry Adsorption

Introduction, Types of adsorption, Isotherms– Freundlich and Langmuir adsorption isotherm, applications of adsorption, application of adsorption in heterogeneous catalysis (automotive catalysts).**Colloids–** Definition, optical properties and application of colloids in industry.

Text books

1. Engineering Chemistry by R.P. Mani, K. N. Mishra, B. Rama Devi /CENGAGE learning.
2. Engineering Chemistry by P.C Jain; Monica Jain, Dhanpatrai Publishing Company (2008).

Reference

1. Engineering Chemistry by B. Siva Shankar McGraw Hill Publishing Company Limited, New Delhi (2006)
2. Engineering Chemistry J.C. Kuriacase; J. Rajaram, Tata McGraw Hills Publishing Company Limited, New Delhi (2004).
3. Text Book of Engineering Chemistry by S.S. Dara; Mukkati S. Chand and Co Publishers, New Delhi (2006)
4. Chemistry of Engineering Materials by CV Agarwal, C. P Murthy, A. Naidu, BS Publications.
5. An Introduction to Electro Chemistry by Samuel Glass stone, East-West Pvt.ltd.
6. Corrosion Engineering by Mars G, Fontana, McGraw Hill

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16MA1202 - MATHEMATICS-III

I Year B Tech. ME, II Semester

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):**16MA1101 Mathematics-I**

Course Objectives

Develop ability to

1. Understand approximation of a polynomial/curve to satisfy the given set of data.
2. Determine approximate zeros of an algebraic/transcendental/system of equations using suitable numerical methods.
3. Evaluate differentiation/integration methods for a given set of data using numerical methods.
4. Apply various numerical methods to compute approximate solution of a given ordinary differential equation with initial conditions.
5. Apply Partial Differential Equations to solve problems in one dimensional heat and wave equations.

Course Outcomes:

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

CO1: Approximate a polynomial/curve to satisfy the given set of data.

CO2: Apply suitable numerical methods to find the approximate root/solution of algebraic/transcendental/system of equations.

CO3: Apply various numerical methods to evaluate differentiation/integration for a given set of data.

CO4: Solve a given ordinary differential equation with initial conditions using suitable numerical methods.

CO5: Apply partial differential equations to solve problems namely, one dimensional wave equation and heat equation.

Syllabus:

UNIT – I: Interpolation and Curve fitting

Interpolation: Introduction-Errors in polynomial Interpolation - Finite Differences - Forward Differences - Backward Differences - Central Differences - Symbolic relations and separation of symbols - Difference Equations - Differences of a polynomial - Newton's formulae for interpolation-interpolation with unevenly spaced points-Lagrange's interpolation formula.

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

UNIT – II: Root finding Methods

Solution of Algebraic and Transcendental Equations and Linear system of equations, Introduction – Graphical interpretation of solution of equations, The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method, Solving system of non-homogeneous equations by L-U Decomposition method (Crout's Method)Jacobi's and Gauss Seidel Iteration method.

UNIT – III: **Numerical Differentiation, Integration**

Numerical differentiation: Newton's forward and backward difference derivatives, Stirling's Central difference derivatives, Numerical integration – General quadrature formula, Trapezoidal rule, Simpson's$1/3^{rd}$and $3/8^{th}$Rule.

UNIT – IV: **Numerical solutions of First order differential equations**

Numerical solution of Ordinary Differential equations: Solution by Taylor's series method – Picard's Method of successive Approximation- single step methods-Euler's Method-Euler's modified method, Runge - Kutta Methods.

UNIT – V: Partial Differential Equations

Introduction and Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation, Method of separation of variables for second order equations –Applications of Partial differential equations- one dimensional wave equation, one dimensional Heat equation.

Text Books:

1. Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.
2. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.

Reference Books:

1. Computer Oriented Numerical Methods by V. Rajaraman, PHI Learning.
2. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.
3. Engineering Mathematics by Srimanta pal, subhodh C. Bhunia, Oxford higher Education.
4. A text book of Higher Engineering Mathematics, Bali N P and Saxena, Lakshmi Publications.
5. Introductory methods of Numerical Analysis by S.S. Sastry, PHI learning.

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16ME1201 - ENGINEERING MECHANICS-II

(CE and ME)

I Year B Tech. ME, II Semester

L	T	P/D	C
2	1	-/-	2

Prerequisite(s): **16ME1102 Engineering Mechanics -I**

16PH1101 Engineering Physics

Course Objectives

Develop ability to

1. Understand connection of forces in trusses and in general frame structures.
2. Understand the principles of dynamics to engineering problems.
3. Understand principles of kinematics and kinetics of particles.
4. Understand the concepts of impulse, momentum of particles, rigid bodies and vibrations associated with dynamics of rigid bodies.

Course Outcomes (COs)

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

CO1: Calculate and analyse the forces in members and structures.

CO2: Apply the principles of dynamics to solve various engineering problems.

CO3: Apply the principles of kinematics, kinetics of particles and rigid bodies to find solutions of problems in straight and curvilinear motions.

CO4**:** Apply the concepts of impulse, momentum and vibrations associated with dynamics of rigid bodies to solve engineering problems.

Syllabus

Unit-I: Analysis of structures: Introduction, construction of trusses, method of joints, method of sections.

Unit-II: Kinematics of a particle: Introduction, Motion of a particle, rectilinear motion, Curved motions, concepts of Kinematics of rigid bodies.

Unit-III: Kinetics of particles: Introduction, Principles of Dynamics, D'Alembert's Principle.

Kinetics of particles: Translation analysis as a particle, concepts of kinetics of rigid bodies.

Unit-IV: Work Energy Method: Introduction, Work energy equation for translation, work energy applied to particle motion, Work energy applied to connected bodies, Work energy applied to plane motion.

Unit-V: Mechanical Vibrations: Introduction, Definitions and concepts, Simple Harmonic Motion, Free vibration, Simple Pendulum, Compound Pendulum, Torsion Pendulum, Free Vibrations with Damping General case.

Text Books:

1. Engineering Mechanics, Ferdinand. L. Singer, (1998), Harper – Collins publishers, New Delhi.
2. Engineering Mechanics, S.S. Bhavikati& J.G. Rajasekharappa, (2012), New Age International, India.

Reference Books:

1. Engineering Mechanics, Timoshenko & Young (2007), McGraw Hill, India.
2. Engineering Mechanics, A.R. Tayal (2009), Umesh Publications, New Delhi.
3. Engineering Mechanics, R.S. Khurmi (2009), S. Chand & Company Limited, New Delhi.
4. Engineering Mechanics, K.L Kumar (2009), Tata McGraw Hill, New Delhi.
5. Engineering Mechanics, Irving. H. Shames (1999), Prentice-Hall, India.

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16ME12L1 - MACHINE DRAWING

I Year B Tech. ME, II Semester

L	T	P/D	C
1	-	-/3	3

Prerequisite(s): **16ME1101Engineering Drawing**

Course Objectives

Develop ability to

1. Understand the concepts of sectioning and method of representing full and half sectional views of various symmetrical and asymmetrical components.
2. Understand the nomenclature associated with screw threaded fasteners, methods to represent and draw internal as well as external screw threads.
3. Understand the use of keys, cotters and pins in temporary joints between two shafts or shaft and hub.
4. Understand and draw assembly of machine parts and its sectional views.
5. Understand and draw disassembly of machine parts and its sectional views

Course Outcomes (COs)

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

CO1: Identify and classify the functionalities of various machine elements such as vices, bearings, screw jacks, shafts, fasteners, keys, cotters, pins and their assembly.

CO2: Draw the machine fasteners.

CO3: Construct an assembly drawing using part drawings of machine components.

CO4**:** Construct a disassembly drawing using machine components from assembled components.

Syllabus

Introduction to Machine Drawing

1. Drawing of Machine Elements and Simple Parts.

Selection of views, additional views for the following machine elements and parts with every drawing proportion.

a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.

b) Keys, cotter joints and knuckle joint.

c) Riveted joints for plates

d) Shaft coupling, spigot and socket pipe joint.

e) Journal, pivot and collar and foot step bearings.

2. Assembly Drawings with Sectional Views:

Cutting planes and section, hatching lines, half sections, aligned sections, offset sections revolved, removed sections, local sections, successive sections, and thin Sections drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

a) Engine parts – stuffing boxes, cross heads, Eccentrics, Petrol Engine connecting rod, piston assembly.

b) Other machine parts - Screw jacks, Machine Vices, Plummer block, Tailstock, Square Tool Post, Revolving Center.

c) Valves- Feed Check Valve, Gate Valve, Non Return Valve, Air Cock.

3. Disassembling of Machine Parts from Assembled Views and Introduction to Part Drawings:

Knuckle joint, coupling, (any one coupling) bearing (any one bearing), Internal Combustion Engine parts, Tool post, Revolving center,

Drawing of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc.

Text Books:

1. Machine Drawing- K.L. Narayana, P. Kannaiah, K. Venkata Reddy, (2012), New Age Publishers/Third Edition.

Reference Books:

1. Machine Drawing - Dhawan, (2010), A Text book of *Machine Drawing*, S. Chand Publications
2. Machine Drawing - N. Siddeshwar, P. Kannaiah, V.V.S. Sastry, (2009), *Machine Drawing*, TMH, India / Twenty First Edition.
3. Machine Drawing – A Singh / Tata McGraw Hill Publishers / Fifth Edition.
5. Brain Griffiths., Engineering Drawing for Manufacture, Kogan Page Science, USA
6. Hart. K R, Engineering Drawing with Problems and Solutions, Hodder and Stoughton, London Sydney Auckland

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16CH12L1 - ENGINEERING CHEMISTRY LAB

I Year B Tech. ME, II Semester

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): None

Course Objectives

Develop ability to

1. Understand the preparation of compounds namely, Aspirin and Biodiesel.
2. Use instrumental methods namely, Potentiometry, Conductometry and Colorimetry to find the concentration of a given solution.
3. Experimentally determine the physical constants namely, viscosity and surface tension of a given liquid using Ostwald's Viscometer and Stalagmometer respectively.
4. Use EDTA method to find the hardness of water, estimate chlorides in hard water by Precipitation titration ferrous iron in water by Dichrometry and Iodine in different salts using Iodometry.
5. Understand the preparation of Oil of Winter green.
6. Experimentally determine ferrous iron in cement by Colorimetric method.

Course Outcomes:

At the end of course, student would be able to

CO1: Employ the techniques which are fundamental in the preparation of Aspirin, Biodiesel and Oil of Winter Green.

CO2: Use various instrumental methods in volumetric analysis namely, Potentiometry, and Conductometry to determine the concentration of a given solution.

CO3: Use various titration methods namely, EDTA, Precipitation, Iodometry and Dichrometry for estimating different chemical compounds/ions present in various samples.

CO4: Estimate the concentration of a coloured compound using the technique of Colorimetry.

CO5: Experimentally determine the physical properties of liquids such as viscosity and surface tension.

Any ten of the following twelve experiments must be conducted.

List of experiments

I. Preparation of compounds

1. Preparation of Aspirin
2. Preparation of Biodiesel

II. Instrumental Methods

A. Potentiometry

3. Titration of Strong acid vs Strong base by Potentiometry.
4. Titration of Weak acid vs Strong base by Potentiometry.

B. Conductometry

5. Titration of Strong acid vs Strong base by Conductometry.

C. Colorimetry

6. Estimation of Copper by Colorimetric method.

III. Physical Constants

7. Determination of Viscosity of given liquid by Ostwald's Viscometer.
8. Determination of Surface tension of given liquid by Stalagmometer.

IV. Titrimetry

9. Estimation of Hardness of water by EDTA method.
10. Estimation of Chlorides in hard water by Precipitation titration.
11. Estimation of Ferrous Iron in water by Dichrometry.
12. Estimation of Iodine in different salts using Iodometry.

Additional Experiments (Mandatory)

1. Preparation of Oil of Winter green.
2. Determination of Ferrous iron in cement by Colorimetric method.

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16MA12L1 - COMPUTATIONAL MATHEMATICS LAB

I Year B Tech. ME, II Semester

L	T	P/D	C
-	-	3/-	2

Prerequisite(s):

16CS1102 Introduction to Computer Programming

Course Objectives

Develop ability to write and execute programs using C-programming/octave/Scilab to

1. Find the solution of system of non-homogeneous equations by L-U decomposition method
2. Construct a polynomial of suitable degree by using the discrete data.
3. Find the numerical solutions of ordinary differential equations using different numerical methods like Taylor's series method, Picard's method, Euler's method, Euler's modified method and Runge-Kutta method, when the usual methods fail to find the general solution of a differential equation.
4. Apply numerical integration methods to find integration of unintegrable functions.

Course Outcomes:

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

CO1: Determine the solution of system of non-homogeneous equations by L-U decomposition method.

CO2: Construct a polynomial of suitable degree by using the discrete data

CO3: Apply Numerical differentiation techniques to find first, second and higher order derivatives, when the function under consideration is not differentiable

CO4**:** Determine the numerical solutions of ordinary differential equations using different numerical methods like Taylor's series method, Picard's method, Euler's method, Euler's modified method and Runge-Kutta method, when usual methods fail to find the general solution of differential equation.

Programming Tasks:

1. Determine y for a given x, if two arrays of x and y of same size are given (using Newton's interpolation both forward and backward).
2. Determine y for a given x, if two arrays of x and y of same size are given(using Lagrange's and Gauss's interpolation)
3. Find the solution of given system of linear equations using L-U decomposition method.
4. Find the solution of given system of linear equations using Jacobi's method.
5. Find the solution of given system of equations using Gauss-seidel iteration method.
6. Find the solution of given system of equations using Gauss Jordan elimination method.

7. Evaluate definite integral using trapezoidal rule, Simpson's $1/3^{rd}$ rule and $3/8^{th}$ rule.
8. Solve a given differential equation using Taylor's series.
9. Solve a given differential equation using Euler's and modified Euler's method.
10. Solve a given differential equation using Runge-Kutta method.

Advance Lab techniques:

1. Solve system of equations using QR-algorithm.
2. Solve system of equations using Predictor-Corrector algorithm.

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16EN12L2 - ENGLISH LAB

I Year B Tech. (CE, ME) II Semester

L	T	P/D	C
-	-	2/-	1

Prerequisite(s):**16EN1101 English-I, 16EN1201 English -II**

Course Objectives

Develop ability to

1. Use Computer-aided Multimedia learning tool for language learning.
2. Sensitize student to the nuances of English speech sounds, accent, intonation and rhythm.
3. Listen actively and speak with intelligibility.
4. Apply language skills in real life situations.

Course Outcomes

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

CO1: Demonstrate the nuances of language through multimedia tools during presentation.

CO2: Demonstrate good writing skills.

CO3: Speak intelligibly.

CO4: Practice usage of International Phonetic Alphabet.

Module: 1

Ice Breaking, JAM

Module: 2

Speech Sounds

Module: 3

Listening Activities (Only for demonstrative purpose)

Module: 4

Situational Dialogues, Debate

Module: 5

Information Transfer

Module: 6

Presentation Skills

Additional Topics

Stress Management

Negotiation Skills

Books Recommended

1. Speaking English Effectively 2nd Edition by Krishna Mohan and N.P.Singh, MacMillan Publishers, 2011.
2. How to prepare for interviews by Shashi Kumar.V and Dhamija P.V
3. English Pronunciation in Use by Hancock, M. 2009, Cambridge University Press
4. Spoken English, a Manual of Speech and Phonetics, by R.K.Bansal and J.B.Harrison, Orient Black Swan 2013.
5. Spoken English CDs by Shashi Kumar and Dhamija
6. A Manual entitled English Language Communication Skills Lab Manual cum Workbook by Cengage Learning India 2013
7. GCET ELCS Lab Workbook.

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16ME2101 - THERMODYNAMICS

II Year B Tech. ME, I Semester

L	T	P/D	C
4	1	-/-	4

Prerequisite(s): **None**

Course Objectives

Develop ability to

1. Understand the concepts of system, boundary, surroundings and temperature.
2. Understand work, heat and internal energy.
3. Understand laws of thermodynamics and their applications.
4. Understand thermodynamic flow and non–flow processes and their applications to nozzles, diffuser, turbines and compressors.
5. Understand the concept of entropy and its applications.
6. Understand various types of thermodynamic cycles, their deviation from actual cycles and their applications.
7. Understand the properties and relationships of thermodynamic fluids (Ideal gases and Steam).
8. Understand the concept of psychrometry and its applications in Refrigeration and air conditioning.

Course Outcomes (COs)

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

CO1: Explain the concepts of continuum, system, control volume, thermodynamic properties, thermodynamic equilibrium, work and heat.

CO2: Apply the laws of thermodynamics to analyze boilers, heat pumps, refrigerators, heat engines, compressors, thermal turbo machines and nozzles.

CO3: Compute energy output, efficiency, and amount of heat energy required for various thermal systems.

CO4: Determine available energy and irreversibility for a given thermal system.

CO5: Apply the concepts of entropy and energy in engineering analysis.

CO6: Evaluate properties of pure substances and gas mixtures.

CO7**:** Explain thermodynamic cycles applied in Refrigeration and air conditioning.

Syllabus:

UNIT - I

Introduction: Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concepts of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact and Inexact Differentials, Cycle - Reversibility - Quasi - static Process, Irreversible Process, Causes of Irreversibility - Energy in State and in Transition, Types, Displacement and Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics - Concept of Temperature - Principles of Thermometry - Reference Points - Const. Volume gas Thermometer - Scales of Temperature, Ideal Gas Scale - Joule's Experiments - First law of Thermodynamics - Corollaries - First law applied to a Process - applied to a flow system - Steady Flow Energy Equation, PMM of first kind.

UNIT - II

Limitations of the First Law - Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Carnot cycle and its Corollaries, Thermodynamic scale of Temperature. Clausius Inequality, Entropy, Principle of Entropy Increase - Energy Equation, Availability and Irreversibility, Maxwell Relations - Elementary Treatment of the Third Law of Thermodynamics.

UNIT-III

Mixtures of perfect Gases - Mole Fraction, Mass friction Gravimetric and volumetric Analysis - Dalton's law of partial pressure., Avogadro's Laws of additive volumes - Mole fraction, Volume fraction and partial pressure, Equivalent Gas constant and Molecular Internal Energy, Enthalpy, specific heats and Entropy of mixture of perfect Gases and Vapour

Atmospheric air Psychrometric Properties - Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, Thermodynamic Wet Bulb Temperature, Specific Humidity. Relative Humidity saturated Air, Vapour pressure, Degree of saturation - Adiabatic Saturation, Carrier's Equation - Psychrometric chart.

UNIT - IV

Perfect Gas Laws - Equation of State, specific and Universal Gas constants - various Non-flow processes, properties, end states, Heat and Work Transfer, changes in Internal Energy - Throttling and Free Expansion Processes - Flow processes. Deviations from perfect Gas Model - Vander Waals Equation of State - Compressibility charts - variable specific Heats - Gas Tables.

Thermodynamic Cycles:

Brayton cycle, Bell-Coleman cycle performance Evaluation

UNIT - V

Phase Transformations - Triple point at critical state properties during change of phase, Dryness Fraction - Clausius - Clapeyron Equation Property tables. Mollier charts - Various Thermodynamic processes and energy Transfer - Steam Calorimetry.

Thermodynamic Cycles:

Rankine cycle - Vapour compression cycle performance Evaluation.

Text Books:

- Engineering Thermodynamics- PK Nag / TMH/ 5th Edition
- Engineering Thermodynamics- E Radhakrishnan / PHI / Second Edition / 2013
- Thermodynamics & Heat Engines- R Yadav /Central publishing house Allahabad/ 7Th edition

References Books:

a) Engineering Thermodynamics- DP Mishra/Cengage Learning/ second impression 2012

b) Thermodynamics - An Engineering Approach/ Yunus A. Cengel& Michael A. Boles / TMH/ 2001

c) Thermodynamics- J.P. Holman /TMH/ 3rd Edition

d) Engineering thermodynamics- J.B. Jones & R.E. Dugan/ John Wiley and sons/ 1st Edition

e) Engineering Thermodynamics- P. Chattopadhyay/Oxford higher Education/Revised First Edition

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16ME2102 - MECHANICS OF SOLIDS

II Year B Tech. ME, I Semester

L	T	P/D	C
4	1	-/-	4

Prerequisite(s):**16ME1102 Engineering Mechanics –I,**

16ME1201Engineering Mechanics – II

Course Objectives:

Develop ability to

1. Understand concepts of stress, strain and their relationships based on elasticity, material behaviour under different types of loading.
2. Understand the concepts of stresses and deformation of a member due to axial loading under uniform and non-uniform conditions.
3. Acquire knowledge to draw shear force and bending moment diagrams for various beams and loads.
4. Understand the concept of bending stress and shear stress for various configurations of the beams.
5. Understand the theory of simple bending.
6. Understand combined stresses and strains at a point across any plane in a two dimensional system.
7. Understand torsion equation to compute torsional stresses in solid and hollow shafts.
8. Understand concept of stresses and strains in thin and thick cylinders.

Course Outcomes (COs):

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

CO1: Analyze and design structural members subjected to tension, compression, torsion and bending using fundamental concepts of stress, strain and elastic behaviour.

CO2: Apply concepts of strength of materials to obtain solutions to real time Engineering problems.

CO3: Determine bending stress and shear stress for various configurations of the beams.

CO4: Evaluate principal stresses, strains and apply the concept of failure theories for design

CO5: Determine the resistance and deformation in members subjected to axial, flexural and torsional loads.

CO6: Apply the torsion equation to compute torsional stresses in solid and hollow shafts.

CO7: Analyse and design thin and thick cylinders.

Syllabus:

UNIT–I

Stresses and Strains: Definitions, types of stresses and strains, elasticity and plasticity. Hooke's law, stress-strain diagrams for engineering materials, modulus of elasticity. Poisson's ratio, relationship between elastic constants, linear and volumetric strains, bars of uniform strength, temperature stresses, compound bars. Strain energy – Resilience.

UNIT–II

Shear force and bending moment: Definition of beam; Types of beams and loads, bending moment and shear force; relationship between intensity of loading, shear force and bending moment; bending moment and shear force diagrams for cantilever, simply supported and overhanging beams carrying point, uniformly distributed loads and uniformly varying load, point of contra flexure.

UNIT–III

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

Shear Stresses in beams: Distribution of shear stresses in rectangular, I- section and T-section for solid and hollow sections, compound stresses.

UNIT–IV

Principal Stresses and Strains: Introduction – Stresses on an inclined section of a bar under axial loading –compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions. Various theories of failure.

UNIT–V

Torsion: Derivation of torsion equation for circular sections, torsional stresses, angle of twist, power transmission, effect of combined bending and torsion.

Cylinders: Stresses in thin cylinders with internal and external pressures. Hoop and longitudinal stresses in cylinders. Volumetric strains – changes in dia, and volume of thin cylinders - Thin spherical shells.

Text Books*:*

1. D.S. Prakash Rao, Strength of Materials A Practical Approach, Universities Press, Hyderabad, 1999.
2. S. Ramamrutham, Strength of Materials, Dhanpat Rai & Sons, 1993.

Reference Books:

1. S.S. Bhavakatti, Strength of Materials, Vikas Publication, 2003.
2. G.H. Ryder, Strength of Materials, Third Edition in SI units, Macmillan India Limited, Delhi, 2002
3. Strength of materials – R.S. Kurmi and Gupta.
4. Strength of Materials by R.K Rajput, S.Chand & Company Ltd.

Geethanjali College of Engineering and Technology

(Autonomous)

Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16ME2103 - METALLURGY AND MATERIAL SCIENCE

II Year B Tech. ME, I Semester

L	T	P/D	C
3	-	-/-	3

Prerequisite(s):**16PH11011 Engineering Physics**

Course Objectives:

Develop ability to

1. Understand concept of crystal structures and deformations.
2. Understand microstructural property relations; analyze the failures of metals and their prevention.
3. Understand phase diagrams.
4. Understand Iron-Iron Carbon equilibrium Diagram.
5. Acquire knowledge in various heat treatment operations, their purpose and applications.
6. Understand various properties and applications of Ferrous, Non Ferrous metals and alloys.
7. Understand various methods of extractive metallurgy techniques.
8. Understand various properties and applications of Ceramics, Polymers and composite materials.

Course Outcomes (COs):

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

CO1: Apply fundamental knowledge of material science for selection and processing of material for engineering applications.

CO2: Suggest appropriate physical metallurgy methods (phase diagrams) for engineering applications.

CO3: Decide type of heat treatment to be given to any metal in order to improve mechanical properties.

CO4: Differentiate various phase diagrams in binary systems.

CO5: Gain knowledge of phase transformation and able to compare the mechanism of both Martensitic and Bainitic phase transformations.

CO6: Explain clearly Iron-Iron Carbon equilibrium Diagram and deduce the type of material.

CO7: Suggest an extraction process for given ore.

CO8**:** Explain the composition of Cast Iron, Steel, Copper, Aluminum and Titanium in terms of their applications.

CO9**:** Explain the composition of ceramics, polymers and composite materials and their applications.

Syllabus

UNIT – I

Mechanical working of metals: Imperfections in crystals, dislocation in crystals, types of dislocations, critical resolved shear stress, effect of slip and twinning on the plastic deformation, cold and hot working, strain hardening and Bauchinger effect, recovery, recrystallization, grain growth and its effect on mechanical properties of metals.

Mechanism of Crystallisation: Grains and grain boundaries, grain size and its effect on the properties, grain size measurement.

UNIT – II

Constitution of Alloys: Necessity of alloying, types of solid solutions, Hume Rothery rules and intermediate alloy phases.

Phase diagrams: construction of phase diagram-methods, Lever rule, Gibbs phase rule, Isomorphous, Eutectic, Eutectoid Transformations with examples.

UNIT – III

Iron-Iron Carbide equilibrium diagram: Allotropy & Cooling curve of pure iron, definition of structures, critical points, lines, areas and temperatures in the Fe-Fe_3C system, solidification and microstructures of slowly cooled steels.

Heat treatment of Steels: Construction of TTT diagrams, continuous cooling transformation (CCT) diagrams, Annealing-Types, Normalizing, Hardening, Tempering, Hardenability.

UNIT IV

Introduction to Extraction Metallurgy: Method of production of pig iron by blast furnace, cast iron by cupola furnace, method of production of steel by Bessemer convertor, L.D process, electric arc process, modern steel making process by electric slag refining.

Engineering materials: Steels: plain carbon steels, Alloy steels, tool steels and stainless steels.

Alloy Steels: Effects of alloying elements like nickel, chromium, manganese, silicon and tungsten, titanium, study about stainless steels, HSS, maraging steels.

UNIT – V

Engineering materials: Cast irons: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, nodular cast iron.

Non-ferrous Metals: Properties and Applications of Copper alloys, Aluminium alloys, Titanium alloys.

Ceramics: Classification, properties and applications of ceramics

Polymers: Classification, properties and applications of polymers.

Composites: Classification, properties and applications of composites, Hybrid composites, Nano composites, Cermets.

Text Books:-

1. Introduction to Physical Metallurgy/Sidney H Avener/Tata McGraw-Hill Education, 1997.
2. V. Raghavan, Materials Science and Engineering, Prentice Hall of India Ltd., 4th Edn. 2005.

References

1.Material Science and Metallurgy/kodgire/12th edition/Everest Publishing house
2.Materials Science and engineering / William and collister/5th edition/John Wiley sons.
3.Mechanical Metallurgy/Dieter George. E/Tata McGraw Hill/1998.
4.Engineering Metallurgy/Higgins R.A/6th Edition/ Viva Books Pvt Ltd.

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16MA2101 - PROBABILITY AND STATISTICS

II Year B Tech. ME, I Semester

L	T	P/D	C
4	1	-/-	4

Prerequisite(s): **None**

Course Objectives:

Develop ability to

1. Understand different types of random variables and their distributions.
2. Estimate population parameters statistically from a sample of population.
3. Estimate correlation coefficient and coefficient of regression of the given data.
4. Examine statistical hypothesis for large and small samples.

Course Outcomes:

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

CO1: Distinguish between random variables pertaining to discrete and continuous distribution systems.

CO2: Compute moments and moment generating functions of Binomial, Poisson and Normal distribution.

CO 3: Calculate sample statistics from given population and estimate population parameters.

CO 4: Identify similarity between two variables using correlation coefficient and coefficient of regression.

CO5: Apply hypothesis procedure to test means and proportions using z-test for large samples and t-test, F-test, chi-square test for small samples.

Syllabus

UNIT-I: Single Random variables and probability distributions

Probability Theory, Baye's Theorem, Random variables – Discrete and continuous, Probability distributions, mass function/ density function of a probability distribution, Mathematical Expectation, Moment about origin, Central moments Moment generating function of probability distribution, Binomial, Poisson & normal distributions and their properties, Moment generating functions of the above three distributions, and hence finding the mean and variance.

UNIT-II: Sampling Distributions& Estimations

Definitions of population, sampling, statistic, parameter, Types of sampling, Expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of variance. Parameter estimations – likelihood estimate, interval estimations.

UNIT-III: Correlation & Regression

Correlation, coefficient of correlation, rank correlation (Karl Pearson's coefficient of correlation, Spearman's coefficient of correlation), regression, regression coefficient, lines of regression.

UNIT-IV: Testing of hypothesis (Large Samples)

Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, Level of significance. One sided test, two sided test, Large sample tests: (i) Test of Equality of means of two samples equality of sample mean and population mean (cases of known variance & unknown variance, equal and unequal variances) (ii) Tests of significance of difference between sample S.D and population S.D. (iii) Tests of significance difference between sample proportion and population proportion & difference between two sample proportions.

UNIT-V: Testing of hypothesis (Small Samples)

Small sample tests: Student t-distribution, its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples Snedecor's F- distribution and it's properties. Test of equality of two population variances Chi-square distribution, it's properties, Chi-square test of goodness of fit.

Text Books:

1. Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.
2. Probability and Statistics for Engineers and Scientists by Sheldon M.Ross, Academic Press
3. Operations Research by S.D. Sharma.

Reference Books:

1. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers
2. Probability and Statistics by John J. Schiller, Murray R Spiegel, A. V. Srinivasan, Tata McGraw - Hill Education.
3. Engineering Mathematics by Srimanta pal, subhodhC.Bhunia, Oxford higher Education.
4. Probability and Statistics by T.K.V.Iyengar&B.Krishna Gandhi Et, S Chand.
5. Fundamentals of Mathematical Statistics by S C Gupta and V.K.Kapoor.
6. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.
7. Operations Research by S. Kalavathy, Vikas Publishing House Pvt LTD.

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16EE2105 – BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

II Year B Tech. ME, I Semester

L	T	P/D	C
3	1	-/-	3

Prerequisite(s): 16PH1101 Engineering Physics
16PH1203 Physics for Engineers

Course Objectives:

Develop ability to

1. Understand basic concepts of Ohm's Law and Kirchhoff's Law applicable in electrical circuits; working principle of voltage, current and power measuring instruments.
2. Understand the principles of operation of DC machines and applications.
3. Understand basic operating principles of single phase transformer, alternator and induction motor.
4. Understand electronic devices namely, p-n diode and zener diode and their applications.
5. Understand fundamental concepts of transistors, SCR and their applications.
6. Understand working principle of Cathode Ray Oscilloscope (CRO).

Course Outcomes:

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

CO 1: Explain basics concepts of electrical circuits and analyze the same.
CO 2: Explain the functioning of voltage, current and power measuring instruments.
CO 3: Explain working of DC machines which include DC generators and DC motors.
CO 4: Explain working of single phase transformer, alternator and induction motor.
CO 5: Explain the functioning of p-n diode, zener diode and their applications.
CO 6: Explain the functioning of transistors, SCR and their applications.
CO 7: Explain working of Cathode Ray Oscilloscope and its application.

Syllabus:

UNIT-I:

Basic Circuit analysis: Basic definitions, types of elements, Ohm's Law, resistive networks, Kirchhoff's Laws, inductive networks, capacitive networks, series, parallel circuits and star-delta and delta-star transformations.

Instruments: Basic principle of measuring instruments – Permanent Magnet Moving Coil (PMMC) and Moving Iron (MI) instruments.

UNIT – II

DC Machines: Construction and Principle of operation of DC generator – EMF equation – windings – lap and wave windings-characteristics of DC generator- types – DC motor types – torque equation – applications –speed control of DC motor- three point starters.

UNIT – III

Transformers: Principle of operation of single phase transformers –EMF equation –OC and SC (open circuit and short current) test of single phase transformer - losses – efficiency and regulation. **AC Machines:** Principle of operation of alternators – regulation by synchronous impedance method –principle of operation of induction motor – slip – torque characteristics – applications.

UNIT – IV

Diodes: p-n junction diode operation, symbol, V-I Characteristics, diode applications, and rectifiers – half wave, full wave and bridge rectifiers (simple problems). zener diode operation, symbol, V-I Characteristics.

Transistors: Regions of operations of transistors, types of configurations of transistors, p-n-p and n-p-n junction transistor, transistor as an amplifier, SCR characteristics and applications.

UNIT – V

Cathode Ray Oscilloscope (CRO): Principles of CRT (Cathode Ray Tube), deflection, sensitivity, electrostatic and magnetic deflection, applications of CRO - Voltage, current and frequency measurements.

EEE: Text Books:

1. Principles of Electrical Engineering, V.K Mehta, Rohit Mehta, S. Chand Publications

2. Basic Electrical Engineering, S.N. Singh, PHI.

EEE: Reference Books:

1. Basic Electrical Engineering, Abhijit Chakrabarthi, Sudipta nath, Chandrakumar Chanda, Tata-McGraw-Hill.

2. Basic concepts of Electrical Engineering, PS Subramanyam, BS Publications.

3. Basic Electrical Engineering, T.K.Nagasarkar and M.S. Sukhija, Oxford University Press.

4. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI.

5. Basic Electrical Engineering by D.P.Kothari , I.J. Nagrath, McGraw-Hill..

ECE: Text Books:

1. Electronic Devices and Circuits, S.Salivahanan, N.Suresh Kumar, A.Vallavaraj,Tata McGraw-Hill companies..

2. Electronic Devices and Circuits, K. Lal Kishore, BS Publications.

ECE: Reference Books:

1. Millman's Electronic Devices and Circuits, J. Millman, C.C.Halkias, and Satyabrata Jit, Tata McGraw-Hill companies.

2. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, PEI/PHI.

3. Introduction to Electronic Devices and Circuits, Rober T. Paynter, PE.

4. Integrated Electronics, J. Millman and Christos C. Halkias, Tata McGraw-Hill companies.

5. Electronic Devices and Circuits, Anil K. Maini, Varsha Agarwal, Wiley India Pvt. Ltd.

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16ME21L1 – METALLURGY AND MECHANICS OF SOLIDS LAB

II Year B Tech. ME, I Semester

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): **None**

Course Objectives:

Develop ability to

1. Acquire knowledge for testing the properties of engineering materials.
2. Understand methods of determining various types of hardness of materials.
3. Acquire knowledge for determining modulus of rigidity of engineering materials.
4. Understand concept of impact test.
5. Acquire knowledge for understanding iron-iron carbon diagram and its applications in engineering.
6. Understand metallographic study and analysis of various Ferrous and non-ferrous metals such as Stainless steel, cast iron, grey cast iron, White Cast iron, Malleable Cast iron and nodular cast iron.
7. Acquire knowledge for determining metallurgical hardness of metals before and after heat treatment.

Course Outcomes (COs):

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

CO1: Identify mechanical properties of materials under various load conditions.

CO2: Estimate the hardness of materials.

CO3: Perform Tension test, Compression test, shear test, torsion test and impact test, to predict failure of materials.

CO4: Identify crystal structure of metals.

CO5: Measure metallurgical hardness to correlate with microstructure.

CO6: Perform a suitable heat treatment on metals to get desired properties.

CO7**:** Identify importance of grain size in evaluating desired mechanical properties of metals.

List of Experiments:

(A)Metallurgy lab: (All of the following must be conducted)

1. Preparation and study of the micro structure of pure material like iron Cu and Al.
2. Preparation and study of the Microstructure of mild steels, low carbon steels, high – C Steels.
3. Study of the Micro Structure of Stainless Steels.
4. Study of the Micro Structure of Cast Irons.
5. Study of the Micro Structure of Non – Ferrous alloys.

6. Hardenability of steel by Jominy End Quench Test.

(B) Mechanics of Solids Lab (Any Six of the following must be conducted)

1. Direct tension test on metal rods.
2. Shear Test.
3. Rockwell and Brinell's hardness test.
4. Compression test.
5. Impact test.
6. Test on a helical spring to determine the Modulus of Rigidity.
7. Torsion test to determine the rigidity modulus of a shaft.

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16ME21L2 - ENGINEERING DRAWING WITH AUTOCAD

II Year B Tech. ME, I Semester

L	T	P/D	C
-	-	3/-	2

Prerequisite(s):**16ME1101Engineering Drawing**

Course Objectives

Develop ability to

1. Acquire knowledge of AutoCAD software functions to create drawings using multiple lines, geometric shapes, and curves and use commands to save and print.
2. Acquire knowledge in graphical communication.
3. Acquire knowledge to locate and apply features of AutoCAD that automate the drafting process and facilitate creation of more accurate drawings with minimum time.
4. Acquire knowledge to locate and apply the features of AutoCAD that provide inclusion of accurate dimensions, tolerances, drawing notes and labels using symbols.
5. Understand AutoCAD software functions and commands to create isometric, three-dimensional drawings.
6. Use AutoCAD software to create 2D and 3D models.

Course Outcomes (COs)

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

CO1: Apply knowledge of graphics and design competencies in developing engineering drawings.

CO2: Apply knowledge of AutoCAD software functions to create drawings using multiple lines, geometric shapes, and curves and use commands to save and print.

CO3: Apply features of AutoCAD that automate the drafting process and facilitate creation of accurate drawings with minimum time.

CO4: Apply the features of AutoCAD to inclusion of accurate dimensions, tolerances, drawing notes and labels using symbols.

CO5**:** Draw various orthographic projections and models (2D and 3D) to describe the engineering components.

List of Exercises

Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.

1. Drawing of a Title Block with necessary text and projection symbol.
2. Drawing of curves like conical curves, spiral, cycloids, involutes using B spline or cubic spline.
3. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.

4. Drawing front view, top view and side view of objects from the given pictorial views (eg. Objects with hole and curves).
5. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
6. Drawing Development of surfaces of different solids with different positions.
7. Drawing isometric projection of simple objects.
8. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3D- model.
9. Assembly drawings: connecting rod, piston, screw jack, universal joint etc.,

Note: Plotting of drawings with dimensioning must be made for each exercise and attached to the records written by students.

References:

1. Computer-aided Engineering Drawing-S Trymbaka Murthy, I. K. International
2. Engineering Graphics with AutoCAD 2002-James D Bethune, Pearson Education
3. Links: http://controlmanuals.com/files/Computing-Software/AutoCAD-p1.html

Geethanjali College of Engineering and Technology

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16EE21L3 – BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

II Year B Tech. ME, I Semester

L	T	P/D	C
-	-	3/-	2

Prerequisite (s): 16PH1101Engineering Physics
16PH1203 Physics for Engineers

Course Objectives:
Develop ability to

1. Understand Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL).
2. Understand magnetization characteristics of DC shunt generator.
3. Understand Swinburne's test and brake test on DC shunt motor.
4. Understand various methods of speed control of DC motor.
5. Understand Open Circuit (OC) and Short Circuit (SC) Tests on a single phase transformer.
6. Understand characteristics of three phase induction motor by brake test.
7. Understand characteristics of p-n junction diode, zener diode, and transistor.
8. Understand full wave and half wave rectifier circuits with and without filters.
9. Understand the working principle of Cathode Ray Oscilloscope (CRO)

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

CO 1: Experimentally **v**erify Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL).

CO 2: Determine critical resistance and critical speed from magnetization characteristics of DC shunt generator.

CO 3: Experimentally validate efficiency of DC machine.

CO 4: Employ various methods of DC motor speed control.

CO 5: Calculate efficiency, percentage regulation and determine the equivalent circuit parameters of single phase transformer.

CO 6: Determine efficiency of three phase induction motor.

CO 7: Determine characteristics of p-n junction diode, zener diode, and transistor

CO 8: Compute ripple factor for full wave and half wave rectifier circuits with and without filters.

CO 9: Explain the working principle of CRO

List of Experiments

SECTION A: ELECTRICAL ENGINEERING

1. Verification of KCL and KVL.
2. Magnetization characteristics of DC Shunt Generator.
3. Swinburne's Test on a DC Shunt Motor.

4. Speed control of DC motor.
5. Brake test on DC a Shunt Motor.
6. OC and SC Tests on a single phase Transformer.
7. Brake test on three phase induction motor

SECTION B: ELECTRONICS ENGINEERING

8. p-n junction diode characteristics (Forward Bias, Reverse Bias)
9. zener diode Characteristics
10. Study of CRO
11. Rectifier without filters (full wave and half wave)
12. Rectifier with filters (full wave and half wave)
13. Transistor CE characteristics (input and output)
14. Transistor CB characteristics (input and output)

Note: Total 12 experiments are to be conducted (six from PART-A, six experiments from PART-B)

Geethanjali College of Engineering and Technology

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16ME2201 - KINEMATICS OF MACHINERY

II Year B Tech. ME, II Semester

L	T	P/D	C
3	1	-/-	3

Prerequisite(s):**16ME2102 Mechanics of Solids**

16ME1101 Engineering Drawing

Course Objectives

Develop ability to

1. Define mechanisms and machines, classify Kinematic Pair and mechanisms.
2. Understand concepts of velocity and acceleration of various links in mechanisms using velocity diagram.
3. Understand concept of Instantaneous center of various mechanisms.
4. Understand classification of cams, design of cam profile using graphical synthesis for various followers such as Knife Edge, Roller and Flat faced Follower.
5. Understand various terms used in Gears and Compare various tooth forms.
6. Acquire knowledge to classify Gear Trains.

Course Outcomes (COs):

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

CO1: Apply principles of kinematic pairs, chains, degree of freedom, inversions, equivalent chains and planar mechanisms for development of practical mechanisms.

CO2: Demonstrate motion of mechanisms and develop kinematic constructions for engineering applications.

CO3: Analyze the planar mechanisms to position, velocity and acceleration.

CO4: Apply basic mechanisms such as slider-crank linkages, four-bar linkage, gears and cams to perform motion analysis by graphical and analytical methods.

CO5: Synthesize planar four bar and slider crank mechanisms for specified kinematic conditions.

CO6: Design cams and followers for specified motion profiles.

CO7: Evaluate gear tooth geometry and select gears for different applications.

Syllabus

UNIT- I

DEFINITIONS AND BASIC CONCEPTS: Introduction, planar mechanisms, link or element, types of links, kinematic pair, types of kinematic pairs, kinematic chain, mechanism, machine, degrees of freedom or mobility, inversion of mechanism, Single slider & Double slider.

LAWS OF FRICTION:- Friction in screw threads, pivots, collars and clutches, friction axis of link and friction circle, efficiency of screw threads and self locking of threads.

UNIT- II

MECHANISMS WITH LOWER PAIRS: Pantograph, Straight line motion mechanisms (exact and approximate).Quadric cycle chain and its inversions, single and double slider crank chain and its inversions, applications, quick return motion mechanisms, Hooke's joint, double hook's joint. Davis and Ackermann steering gear mechanisms.

UNIT – III

VELOCITY ANALYSIS: Absolute and Relative Motions, motion of a link, velocity of rubbing, velocity diagrams for four bar mechanism, single slider mechanism and quick return motion mechanisms, Instantaneous Centre, Kennedy's theorem, Instantaneous centre four bar and single slider mechanisms.

Acceleration Analysis: Acceleration diagrams for four bar and single slider mechanism, Coriolis Component of acceleration, acceleration diagrams for crank and slotted lever mechanism.

UNIT – IV

CAMS and FOLLOWERS:- Types of cams and followers, displacement diagrams for followers, uniform motion, simple harmonic motion, cycloidal motion, cam profile with knife-edge follower, translating roller follower and translating flat follower, cams specified counter, tangent cam with follower, circular arc cam with roller follower.

UNIT – V

GEARS: Classification of Gears, gear terminology, law of gearing, velocity of sliding, path of Contact, arc of contact, number of pairs of teeth in contact, forms of teeth. Interference in involute gears, minimum number of teeth, interference between rack and pinion.

GEAR TRAINS: Simple gear train, compound gear train, reverted gear train, planetary or epicyclic gear train, velocity ratio of epicyclic gear train (tabular method) , torques in epicyclic trains. Simple problems on gear trains.

Text Books:

1. S. S. Rattan [2005], Theory of Machines, TMH Publishers, New Delhi.
2. Sadhu Singh [2006], Theory of Machines, Pearson Education, New Delhi.

Reference Books:

1. Ballaney [2003], Theory of Machines, Khanna Publishers, New Delhi.
2. R. S. Khurmi, J. K. Gupta (2010), Theory of machines, S. Chand Pub, New Delhi, India.
3. Thomas Bevan [2002], Theory of Machines, CBS Publishers, New Delhi.
4. J.S. Rao and R.V. Dukkipati [2006], Mechanisms and Machine Theory, NAI Publishers, New Delhi.
5. J.E. Shigley Theory of Machines and Mechanisms, McGraw Hill Publishers, New York.
6. Jagdish Lal Theory of Mechanisms and Machines, Metropolitan Publishers, New Delhi
7. R. L. Norton (2011),Kinematics and dynamics of machinery (SIE), Tata McGraw-Hill education (P) Ltd, New Delhi, India.

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16ME2202 - THERMAL ENGINEERING -I

II Year B Tech. ME, II Semester

L	T	P/D	C
3	1	-/-	3

Prerequisite(s):**16ME2101Thermodynamics**

Course Objectives:

Develop ability to

1. Understand thermodynamic analysis of different air standard cycles.
2. Understand engine components, working principles of Internal Combustion (IC) engines, auxiliary systems.
3. Understand combustion aspects of Spark Ignition (SI) and Compression Ignition (CI) engines in addition to the methods of improving performance.
4. Understand testing performance of Gasoline and Diesel Engines.
5. Understand working principle of fuel injection, spark ignition, cooling, lubrication and fuel properties.
6. Distinguish combustion phenomena in SI and CI engines and factors influencing combustion chamber design.

Course Outcomes (COs):

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

CO1: Explain working and performance of IC Engines through thermodynamic cycles.

CO2: Explain various components, principle of operation, working of different types of IC engines.

CO3: Evaluate performance of diesel and petrol engines and suggest suitable methods for remedy of abnormal combustion.

CO4**:** Evaluate variables affecting performance of IC engines and methods to improve performance.

Syllabus

UNIT – I

Air standard cycles: Otto cycle, Diesel cycle, Dual combustion cycle, and its comparison, Stirling cycle, Ericsson cycle, Atkinson cycle and Lenoir cycle.

UNIT – II

Actual cycle and their analysis: Introduction, comparison of Air standard and Actual cycles, Time loss factor, Heat loss factor, Exhaust Blow Down, Loss Due to Gas Exchange Process, Volumetric Efficiency.

UNIT – III

I.C. ENGINES: Four and two stroke engine – SI and CI engines- Valve and Port Timing Diagrams, Fuel injection systems for SI engines- Fuel Injection Systems for CI engines, Ignition, Cooling and Lubrication systems-Fuel properties and Combustion.

Testing and Performance of Engines: Measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – performance test-heat balance sheet and chart.

UNIT- IV

Combustion in S.I. Engines : Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Type of Abnormal combustion, pre-ignition and knocking (explanation of) – Fuel requirements and fuel rating, anti-knock additives – combustion chamber – requirements, types.

UNIT-V

Combustion in C.I. Engines: Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence – open and divided combustion chambers and fuel injection – fuel requirements and fuel rating.

Text books:

1. I.C. Engines- V. Ganesan/ TMH/ 4Th Edition.
2. I.C. Engines- John B. Heywood/TMH/ 2015

References:

1. I.C. Engines-M. L. Mathur and Sharma/ Dhanpath Rai & Sons/Fifth Edition/ 2013
2. Thermal engineering- R Rudramoorthy/ TMH/2003
3. Thermal engineering- P.K.Nag/3 rd Edition.
4. Thermal engineering- R.K. Rajput/ Lakshmi Publications/Eighth edition/2010
5. I.C. Engines- K. K. Ramalingam/Scietech publishers/2nd Edition

Geethanjali College of Engineering and Technology

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16ME2203 - PRODUCTION TECHNOLOGY-I

II Year B Tech. ME, II Semester

L	T	P/D	C
4	-	-/-	4

Prerequisite(s):**16WS11L11 Engineering Workshop**

Course Objectives

Develop ability to

1. Understand manufacturing processes such as casting, welding and forming along with their inherent merits, demerits and applications.
2. Understand basic aspects of pattern preparation and testing of moulding sand.
3. Understand principle, procedure and applications of various special casting methods.
4. Understand design of patterns, gating system and riser.
5. Understand principle of operation, applications, advantages and limitations of various welding processes.
6. Understand various defects of casting and welding, causes and remedies.
7. Understand principle of hot and cold working processes.
8. Understand fundamentals and applications of rolling, forging, extrusion, tube making, swaging, spinning, coining and wire drawing processes.
9. Understand fundamentals of sheet metal working, and high energy rate forming.

Course Outcomes (COs)

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

CO1: Choose appropriate manufacturing process for a given component.

CO2: Select material, type and allowances of patterns used in casting.

CO3: Design core, core print and gating system in sand moulding practice.

CO4: Choose appropriate casting method for an engineering component.

CO5: Choose proper welding processes for given application.

CO6: Identify various casting and welding defects and suggest remedy for the same.

CO7**:** Choose proper metal working processes for given application.

Syllabus

Unit I: Metal Casting Processes- Manufacturing: Selecting manufacturing process – Fundamentals of materials- their behaviour and manufacturing properties – Ferrous metals and alloys – Non ferrous metals and alloys –Fundamentals of metal casting – design of gating system- Fluidity of molten metal – Solidification time calculations.

Unit II: Sand casting: Shell mould casting - Investment casting - Plaster mould casting – Ceramic mould casting – Die casting - Centrifugal casting – Melting practice and furnaces - Defects in casting – Testing and inspection of casting.

Processing of plastics: Types of moulding-injection moulding-blow moulding

Unit III: Metal Joining Processes: welding types -Oxy fuel gas welding –standard time and cost calculations, Arc welding, forge welding – Resistance welding ,Thermit welding, TIG welding.

MIG welding, Friction welding, Induction welding, explosive welding, Laser welding, Soldering and brazing, Heat affected zone in welding.

Welding defects: causes and remedies –destructive and non-destructive testing of welds.

Unit IV: Metal Forming Processes:

Cold and Hot working: Strain hardening, recovery, re-crystallisation and grain growth, Comparison of properties of Cold and Hot worked parts, Rolling fundamentals – theory of rolling, types of Rolling mills and products - Forces in rolling and power requirements. Stamping, forming and other working processes: Blanking and piercing – coining- Bending and forming. Forces and power requirement for the above operations.

Drawing and its types – wire drawing and tube drawing –Hot and cold spinning-Types of presses and press tools.

Unit V: Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers – Rotary forging – forging defects – cold forging, swaging, Forces in forging operations

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion – Forwards extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making –Hydrostatic extrusion- Forces in extrusion.

Text books:

1. *Manufacturing Technology*, P. N. Rao (2011), *Vol -1*, 3rd edition, Tata McGraw- Hill education (P) Ltd, New Delhi.
2. *Manufacturing Engineering and Technology*, S. Kalpakjain (2005), 4th edition, Pearson Education, New Jersey.
3. Workshop Technology (Vol 1)/Hajra Chowdary/Asia Publishing House/2nd Edition

Reference:

1. *Production Technology*, R. K. Jain (2010), 16th edition, Khanna publishers, New Delhi, India.
2. *A course in workshop Technology*, B. S. Raghuwanshi (2011), Vol - II, 3rd Edition, Dhanpat Rai & Co, New Delhi, India.
3. *Manufacturing science*, Gosh and Malik (2004), Affiliated East-west press (p) Ltd, New Delhi, India

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16ME2204 - MECHANICS OF FLUIDS AND HYDRAULIC MACHINERY

II Year B Tech. ME, II Semester

L	T	P/D	C
3	1	-/-	3

Prerequisite(s): **None**

Course Objectives:

Develop ability to

1. Understand the fundamental properties of fluids.
2. Understand basic concepts of conservation of mass, energy and momentum equations and application to simple problems.
3. Understand concept of basic boundary layer theory.
4. Understand working principles of pressure, velocity and discharge measuring devices.
5. Understand momentum and angular momentum principles.
6. Understand basic principles of impact of jet on vanes.
7. Understand working of various turbines such as Pelton wheel, Francis and Kaplan turbines.
8. Understand working of centrifugal and reciprocating pumps.

Course Outcomes (COs):

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

CO1: Explain fluid properties and types of fluid flows.

CO2: Apply conservation of mass, energy and momentum laws to fluid flow problems in engineering applications.

CO3: Formulate one and three dimensional compressible fluid flow problems and solve the same.

CO4: Compute drag and lift forces using theory of boundary layer.

CO5: Analyse practical problems of various turbines used in Industry and hydro power plants.

CO6: Specify and select suitable turbine based on head requirements.

CO7: Design working proportions of hydraulic machines (pumps and turbines).

CO8**:** Solve various engineering problems related to centrifugal and reciprocating pumps used in agriculture, domestic and industrial applications.

Syllabus

UNIT I: Fluid statics : Dimensions and units: Concept of continuum physical properties of fluids- specific gravity, viscosity surface tension- vapour pressure and their influence on fluid motion Pascal's –law ,hydrostatic law , atmospheric gauge and vacuum pressure – measurement of pressure- Piezometer, U-tube and differential manometers.

Fluid Kinematics: Stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform, non uniform, laminar, turbulent, rotational, and irrotational flows

UNIT II: Fluid dynamics: Equation of continuity for one and three dimensional flow. Buoyancy concept, –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend. Measurement of flow: Pitot tube, venturimeter, orifice meter and Flow nozzle.

UNIT III: Boundary layer concepts: Definition and thickness, laminar and turbulent boundary layers (no derivation) ,separation of boundary layer submerged objects –drag and lift

Closed conduit flow: Reynolds's experiment- Darcy-Weisbach equation- minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line.

UNIT IV: Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work don and efficiency, flow over radial vanes.

Hydraulic Turbines: Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design

Performance of hydraulic turbines: Draft tube theory functions and efficiency. Specific speed of turbine, Geometric similarity, Unit and specific quantities, characteristic

Curves, governing of turbines, selection of type of turbine, cavitations, surge tank. Water hammer

UNIT V: Centrifugal pumps: Classification, working, work done –barometric head- losses and efficiencies specific speed- pumps in series and parallel-performance characteristic curves, Priming, NPSH.

Reciprocating pumps: Working, Discharge, slip, indicator diagrams.

Text Books:

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH, Standard book house. Delhi 1991.volume 1.
2. Fluid Mechanics and Hydraulic Machines by Rajput, s. chand & company ltd. Delhi. 2008.

References:

1 Fluid Mechanics & fluid power engineering by D.S. Kumar, S.K. Katiraia & Sons publications
1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by Cengel & Cibala, New Age International.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16CH2201 - ENVIRONMENTAL STUDIES

(ECE, EEE, ME and CE)

II Year B Tech. ME, II Semester

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course Objectives:

Develop ability to

1. Identify the importance of ecosystem and its functions.
2. Understand the natural resources and their usage in day to day life.
3. Understand the concept of bio-diversity, its values and conservation.
4. Be aware of the causes of different types of pollution and its control.
5. Understand various environmental impacts, requirement of various policies and legislations towards environmental sustainability.

Course Outcomes:

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

CO1: Explain ecosystem and its functions namely, food chain, ecological pyramids etc.

CO2: Acquire knowledge about different types of natural resources such as land, water, minerals, non-renewable energy and their excessive usage leading to detrimental effects on environment.

CO3: Comprehend ecosystem diversity, its values and importance of hot spots to preserve the same.

CO4: Explain different types of pollution, its control and impact on global environment.

CO5: Recognize various environmental impacts and the importance of various acts and policies towards environmental sustainability.

Syllabus:

UNIT- I: Ecosystem

Scope and importance of ecosystem, Classification of ecosystem, Introduction to biotic and abiotic components, Forest and desert ecosystem, Functions of eco system food chains, food webs and ecological pyramids, Flow of energy in an ecosystem, Biogeochemical cycles-Nitrogen cycle and Carbon cycle, Phosphorous cycle and Hydrological cycle.

UNIT- II: Natural Resources

Classification of resources, Water resources-Use and over utilization of surface and ground water, Mineral resources-Environmental effects of extracting and using mineral resources – Case study, Land resources – Land degradation, man induced landslides, Energy resources – renewable, solar energy, wind energy, applications, Non renewable resources- fossil fuels, nuclear energy, Chernobyl and Fukushima Daiichi nuclear disasters.

UNIT- III: Biodiversity and Biotic Resources

Introduction, definition, genetic, species and ecosystem diversity, Types of diversity, Alpha, Beta and Gamma, Value of biodiversity- Consumptive use, productive use , ethical, aesthetic and intrinsic values , Hotspots of biodiversity in India, Threats to biodiversity, Conservation of biodiversity – In-situ and Ex-situ methods, bioaccumulation and biomagnifications.

UNIT- IV: Environmental Pollution and Control Technologies

Classification of Pollution, Air pollution causes, effects and remedial measures , Water pollution, causes, effects and remedial measures, Noise Pollution, Emission standard limits, Acid rains. Waste water treatment technologies- Common and Combined Effluent Treatment Plants (CETP), Thermal Pollution causes, effects and remedial measures, Solid Waste Management, Green house effect and Global warming, Ozone layer depletion and its effects.

UNIT- V: Environmental Policy, Legislation & EIA

Definition of Impact and Types of Impact, Steps involved in Environmental Impact Assessment (EIA) methodology, methods of base-line data acquisition, Impacts of development on different environmental components, Prediction of Impacts , Methods of rain-water harvesting traditional and modern methods , National Environmental Policy. Air conservation act , Water conservation act, Forest conservation act.

Towards Sustainable Future: Concept of Sustainable development, Threats of sustainable development, Environmental Education, Conservation of resources, Concept of Green building.

TEXT BOOKS:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha - University Grants Commission.
2. Environmental Studies by Anubha Kaushik & C.P. Kaushik

REFERENCE BOOKS:

1. Textbook of Environmental Sciences and Technology by M. Anji Reddy, B S Publication
2. Environmental Studies by R. Rajagopalan, Oxford University Press.
3. Introduction to Environmental Management by Mary.k. Theodare, Louis Theodare, CRC Press, Taylor &Francis group.
4. Fundamentals of Ecology by Eugene P. Odum, Gary W.Barrett, Thomson International.

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16ME22L1 - MECHANICS OF FLUIDS AND HYDRAULIC MACHINERY LAB

II Year B Tech. ME, II Semester

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): **None**

Course Objective:

Develop ability to

1. Understand fundamental principles of fluid mechanics to solve practical mechanical engineering problems of water conveyance in pipes and pipe networks.
2. Understand application of hydraulic machinery.
3. Learn to conduct performance tests on pumps and turbines.
4. Understand operating characteristics and factors affecting performance of hydraulic machinery (pumps and turbines).

Course Outcomes (COs):

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

CO1: Demonstrate basic knowledge of fluid mechanics in solving problems and design of pressure pipe systems used in mechanical engineering

CO2: Verify Bernoulli's principle.

CO3: Determine friction factor for a given pipe.

CO4: Calibrate flow discharge measuring device used in pipes, channels and tanks.

CO5: Apply basics of hydraulic machinery and their operation in water systems.

CO6: Test performance of pumps and turbines.

CO7: Conduct experiments and interpret data in flow measurement, hydraulic machinery.

List of Experiments:

1. Impact of jet on vanes.
2. Calibration of venturimeter.
3. Calibration of orifice meter.
4. Determination of friction factor for a given pipe.
5. Determination of loss of head due to sudden contraction.
6. Verification of Bernoulli's theorems.
7. Performance test on Pelton wheel.
8. Performance test on Francis turbine.
9. Performance test on Kaplan turbine.
10. Performance test on single stage centrifugal pump.
11. Performance test on multi stage centrifugal pump.
12. Performance test on reciprocating pump.

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16ME22L2 - PRODUCTION TECHNOLOGY- I LAB

II Year B Tech. ME, II Semester

L	T	P/D	C
-	-	3/-	2

Prerequisite(s):**16WS11L1 Engineering Workshop**

Course Objectives

Develop ability to

1. Acquaint with the welding equipment, forming dies and sand casting process.
2. Gain hands on experience in the areas of welding, casting and forming.

Course Outcomes (COs):

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

CO1: Test the properties of moulding sands.

CO2: Design and making of wooden patterns.

CO3: Select the welding process for a given fabrication.

CO4: Fabricate joints using gas welding and arc welding.

CO5: Perform injection moulding, blow moulding using plastics.

Syllabus

I. METAL CASTING

1. Pattern design and making - for casting drawing.
2. Sand properties testing-exercise-for strength.
3. Moulding, Melting and Casting-1 Exercise.

II.WELDING

1. ARC Welding Lap & Butt Joint-2 Exercises.
2. Spot Welding-1 Exercise
3. TIG Welding-1 Exercise
4. MIG Welding-1 Exercise
5. Plasma Welding and Brazing-2 Exercises (Water Plasma Device)

III.MECHANICAL PRESS WORKING

1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
2. Hydraulic Press: Deep drawing and extrusion operation.
3. Bending and other operations.

IV. PROCESSING OF PLASTICS

1. Injection Moulding
2. Blow Moulding

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Cheeryal (V), Keesara (M), Medchal District – 501 301 (TS)

16ME22L3 - KINEMATICS OF MACHINERY LAB

II Year B Tech. ME, II Semester

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): **None**

Course Objectives

Develop ability to

1. Understand basic principle of Cam follower motion and Gyroscope.
2. Understand various mechanisms of kinematics.
3. Understand importance of static and dynamic balancing.
4. Acquire knowledge for evaluating stability of dynamic systems.

Course Outcomes (COs):

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

CO1: Evaluate effect of gyroscopic couple and Cam follower motions in machines.

CO2: Estimate performance of governors.

CO3: Evaluate static and dynamic balancing of rotating and reciprocating machines.

CO4**:** Analyse mechanisms for specific type of motion in machines.

List of Experiments

1. To study various types of Links, Pairs, Chain and Mechanism
2. To study various kinds of belts drives.
3. To study various types of Cam and Follower arrangement.
4. To study Different types of Gears.
5. To study Different types of Gear Trains.
6. Determination of damped natural frequency of vibration of the vibrating system with different viscous oils.
7. Determination of steady state amplitude of a forced vibrating system.
8. Static balancing using steel balls.
9. Determination of the magnitude and orientation of the balancing mass in dynamic balancing.
10. Field balancing of the thin rotors using vibration pickups.
11. Determination of the magnitude of gyroscopic couple, angular velocity of precession and representation of vectors.
12. To study and find coefficient of friction between belt and pulley.

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16HS22L1 - GENDER SENSITIZATION

II Year B Tech. ME, II Semester

L	T	P/D	C
-	-	3/-	2

Prerequisite(s): **None**

Facilitate students to

1. Sensitize with regard to gender issues.
2. Provide a critical perspective on the requirements of healthy socialization of both genders.
3. Create awareness and understanding on some of the key biological changes of both genders.
4. Apprise on the importance of sharing domestic work and the economic contribution of women.
5. Create awareness on the impact of gender violence on society.
6. Create consciousness on the contribution of women of Telangana in its development.

Course Outcomes

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

CO1: Demonstrate sensitivity with regard to gender issues.

CO2: Show healthy socialization among both the genders that can be observable.

CO3: Show empathy on some of the key biological changes of both genders.

CO4: Realize the importance of sharing domestic work and economic contribution of women.

CO5: Realize the impact of gender violence on society.

CO6**:** Show awareness on the contribution of women of Telangana in its development.

Unit-I:

UNDERSTANDING GENDER:

Gender: why should we study it? ***(Towards a world of equals: Unit-1)***

Socialization: Making women, making men (*Towards a world of equals: Unit-2*)

Introduction, Preparing for Womanhood, Growing up male, first lessons in caste, Different masculinities.

Just relationships: being together as Equals (***Towards a world of equals: Unit-12)***

Mary kom and Onler. Love and Acid just do not mix. Love Letters. Mother and Fathers, Further reading: Rosa Parks-The Brave Heart.

Unit-II:

GENDER AND BIOLOGY:

Missing women: Sex selection and its consequences ***(Towards a world of equals: Unit-4)***

Declining sex Ratio, Demographic consequences.

Gender spectrum: beyond the Binary (*Towards a world of equals: Unit-10)*

Two are many? Struggles with discrimination.

Additional reading: our Bodies, our Health (*Towards a world of equals: Unit-13)*

Unit –III:

GENDER AND LABOUR:

House work: the invisible Labour (*Towards a world of equals: Unit-3)*

"My mother doesn't work". "share the load".

Women's work: its politics and economics (*Towards a world of equals: Unit-7)*

Factand fiction. Unrecognized and work. Further reading: Wages and condition of work.

Unit-IV:

ISSUES OF VIOLENCE:

Sexual Harassment: Say No! *(Towards a world of equals: Unit-6)*

Sexual Harassment, not Eve-teasing- coping with Everyday Harassment-Further reading: "chupulu".

Domestic violence: speaking out (*Towards a world of equals: Unit-8)*

Is home a safe place? – When women unite [film].Rebuilding lives. Further Reading: New Forums for justice.

Thinking about sexual violence (*Towards a world of equals: Unit-11)*

Blaming the victim– "I Fought for my life ....." –Further Reading: The Caste Face of violence.

Unit – V:

GENDER STUDIES:

Knowledge: Through the lens of Gender (*Towards a world of equals: Unit-5)*

Point of View. Gender and the Structure of Knowledge. Further Reading: Unacknowledged women Artists of Telangana.

Whose History? Questions for Historians and Others *(Towards a world of equals: Unit-**9)***

Reclaiming a past. Writing other Histories. Further Reading: Missing pages from Modern Telangana History.

Text Book (s):

Towards a World of Equals: A Bilingual Textbook on Gender" Written by A. Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Asma Rsheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu.

Note: Since it is inter disciplinary Course, Resource persons can be drawn from the fields of English Literature or sociology or political science or any other qualified faculty who has expertise in this field.

1. Sen, Amarthya. "More than one million Women are missing."New York Review of Books 37.20 (20 December 1990). Print. "We were Making History....." Life Stories of Women in the Telangana People's Strugle. New Delhi: Kali for Womwn, 1989.

2. Tripti Lahiri. "Bythe Numbers: Where Indian Women Work." Women's Studies Journal (14 November 2012) Available online at: http// blogs.wsj.com/ India real time/2012/11/14/by-the-number-where Indian-women-work/>
3. K. Sathyanarayana and Susie Tharu (Ed), "Steel Nibs Are sprouting: New Dalit writing South India", Dossier 2: Telugu And Kannada http://harpercollins.co.in/BookDatails.asp?Book cod=3732
4. Vimala. "Vantillu (The Kitchen)". Women Writing in India: 600 BC to the present. Volume //: the 20th Century Ed. Susie Tharu and K. Llita. Delhi: Oxford University Press, 1995. 599-601.
5. Shatugna, Veena *et at*. "Women's work and its Impact on Child Health and Nutrition", Hyderabad, National Institute of Nutrition, Indian Council of Medical Research 1993.
6. Stree Shakti Sangatana. "We were Making History....." Life Stories of Women in the Telangana People's stuggle. New Delhi: Kali for Women, 1989.
7. Menon, Nivedita. "Seeing like a Feminist". New Delhi: Zubban-Penguin Books, 2012
8. Jayaprabha A "Chupulu (Stares)". Women Writing in India: 600BC to the present. Volume //. The 20th Century Ed. Susie Tharu and K. Llita. Delhi: Oxford University Press, 1995. 596-597.
9. Javeed, Shyan and Anupam Manuhaar. "Women and Wage Discrimination in India: A Critical analysis." International Journal of Humanities and Social Science invention 2.4(2013).
10. Gautham, Liela and Gita Ramaswamy. "A conversation between a Daughter and Mother."Broadsheet on contemporary politics. Special issue on Sexuality and Harassment: Gender Politics on Campus Today. Ed. Madhumeeta sinha and Asma Rasheed. Hyderabad: Anveshi Research center for Women's Studies, 2014.
11. Abdulali Sohaila. "I Fought for for My Life ....and Won." Available online at: http//www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
12. Jaganathan Pradeep, Partha Chetterjee (Ed). "Community, Gender and Violence Subaltern Studies XI". Permanent black and Ravi Dayal Publishers, New Delhi, 2000
13. K. Kapadia. "The violence of Develop: the politics of Identity, Gender and Social Inequalities in India". London: Zed Boos, 2002.
14. S. Benhabib. "Situating the Self: Gender, Community, and post modernism in contemporary Ethics", London: Routledge, 1992.
15. Viginia Woolf. "A Room of one's Own". Oxford: Black Swan. 1992
16. Banuri and M. Mahmood. "Just Development: Beyond Adjustment with a Human Face", Karachi: Oxford University Press, 1997.

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Cheeryal (V), Keesara (M), Medchal District–501 301 (TS)

16ME3101 – Instrumentation and control systems

L	T	P/D	C
4	1	-/-	4

III Year B.Tech, ME, I Semester

Pre-requisites: Basic Electrical and Electronics Engineering
Course Objectives:

1. Be able to measure common physical quantities using common sensors.
2. To implement the temperature measurement techniques.
3. To define the pressure measuring techniques.
4. To introduce techniques of acceleration, Vibration and density measurements.
5. To analyse the measurement techniques of force, torque and speed.

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

CO1	Recognize the measurement techniques and the use of measuring instruments
CO2	Describe the working process of the equipments used in measurement of temperature and pressure.
CO3	Demonstrate the use of level and flow measuring equipments.
CO4	Predict the stress, and strain measurement.
CO5	To justify the basics of control system theory.

Detailed Syllabus:

UNIT-I: BASIC PRINCIPLES OF MEASUREMENT: Definitions, Measurement systems, generalized configuration and functional descriptions of measuring instruments – examples. Dynamic performance characteristics – sources of error, Classification and elimination of error.

MEASUREMENT OF DISPLACEMENT: Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

UNIT-II: MEASUREMENT OF TEMPERATURE: Classification – Ranges – Various Principles of measurement – Expansion, Electrical Resistance – Thermistor – Thermocouple – Pyrometers – Temperature Indicators.

MEASUREMENT OF PRESSURE: Units – classification – different principles used. Manometers, Piston, Bourdon pressure gauges, Bellows – Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges – ionization pressure gauges, McLeod pressure gauge.

MEASUREMENT OF LEVEL: Direct method – Indirect methods – capacitive, ultrasonic, magnetic, cryogenic fuel level indicators – Bubler level indicators.

UNIT-III: FLOW MEASUREMENT: Rotameter, magnetic, Ultrasonic, Turbine flow meter, Hot – wire anemometer, Laser Doppler Anemometer (LDA).

MEASUREMENT OF SPEED: Mechanical Tachometers – Electrical tachometers – Stroboscope, Non-contact type of tachometer.

MEASUREMENT OF ACCELERATION AND VIBRATION: Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle.

UNIT-IV: STRESS - STRAIN MEASUREMENTS: Various types of stress and strain measurements – electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending, compressive and tensile strains – usage for measuring torque, Strain gauge Rosettes.

MEASUREMENT OF FORCE, TORQUE AND POWER: Elastic force meters, load cells, Torsion meters, Dynamometers.

UNIT-V: MEASUREMENT OF HUMIDITY: Moisture content of gases, sling psychrometer, Absorption psychrometer, and Dew point meter.

ELEMENTS OF CONTROL SYSTEMS: Introduction, Importance – Classification – Open and closed systems, Servomechanisms–Examples with block diagrams–Temperature, speed and position control systems.

Text Books:

1. Doebellin, E.O.and Manik D.N., Measurement systems Application and Design, Special Indian Edition, Tata McGraw Hill Education Pvt. Ltd, 2007.
2. Jones. B.E, Instrument Technology, Vol.2, Butterworth-Heinemann, International Edition, 2003.
3. A. K. Sawhney, Puneet Sawhney Course in Mechanical Measurements and Instrumentation and Control Dhanpat Rai & Sons, New Delhi, 1999.

References:

1. D.S Kumar, “Measurement Systems: Applications & design”, 6th Edition, Metropolitan, 2002
2. B.C.Nakra & K.K.Choudhary, “Instrumentation measurement & analysis”, 4th Edition, TMH,1999.
3. Liptak B.G., Instrumentation Engineers Handbook (Measurement), CRC Press, 2005
4. Patranabis D., Principles of Industrial Instrumentation, 3rd Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2010.
5. Eckman D.P., Industrial Instrumentation, Wiley Eastern Limited, 1990.
6. S.K.Singh., Industrial Instrumentation and Control, 3rd Edition, Tata McGraw - Hill Education, 2008.
7. R.K Jain, Mechanical and Industrial Measurements, Khanna Publishers, Delhi, 1999.

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Cheeryal (V), Keesara (M), Medchal District–501 301 (TS)

16ME3102 -PRODUCTION TECHNOLOGY-II

III Year B.Tech, ME, I Semester

L	T	P/D	C
3	1	-/-	3

Pre-requisites: Engineering Workshop.

Course Objectives:

1. To understand the fundamental knowledge of metal cutting and principles in metal removal processes.
2. To know the fundamentals and principles of metal cutting in practical applications through multiple labs like lathes, milling machines, grinding machines, and drill presses, Computer Numerical Control etc.
3. To demonstrate the fundamentals of finish machining processes.
4. To describe the basic knowledge of metrology components.
5. To develop fundamental knowledge on tool materials, cutting fluids and tool wear mechanisms.

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

CO1	Reside objectives and key factors in Elementary treatment of metal cutting theory.
CO2	Explain the theoretical and experimental knowledge on lathe, Shaping , slotting , planning , Drilling, and Boring Machines
CO3	Describe the theoretical and experimental knowledge to conduct experiments on Milling, Lapping, Honing, Broaching, and Grinding Machines.
CO4	Analyses the fundamentals of metrology components.
CO5	Compare and design the limits and fits system.

Detailed Syllabus:

UNIT-I: THEORY OF METAL CUTTING: Elements of cutting process - Geometry of single point cutting tool, chip formation and types of chips, Mechanics of metal cutting - Merchant's Force diagram- Cutting forces, Tool wear and Tool life, Cutting fluids, Tool materials.

UNIT-II: MACHINE TOOLS: Principle of working, specifications, classifications, operations performed and constructional features of Lathe machine, Milling machine, Drilling machine, Shaping machine, Planning machine and Slotting machine.

UNIT-III: FINISH MACHINING: Principle of working, specifications, classifications, operations performed and constructional features of Grinding machine. Different types of

abrasives - bonds specification of a grinding wheel and selection of a grinding wheel. Lapping, Honing and Broaching Operations.

UNIT-IV: LINEAR MEASUREMENT: Length standard: line and end standard, slip gauges - calibration of slip gauges, Dial indicator, micrometers.

MEASUREMENT OF ANGLES AND TAPERS: Different methods - Bevel protractor - angle slip gauges - spirit levels - single bar - Sine plate used to determine the tappers.

OPTICAL MEASURING INSTRUMENTS: Tool maker's microscope and its uses - collimators, optical projector - optical flats and their uses, interferometer.

FLAT SURFACE MEASUREMENT: Measurement of flat surfaces - instruments used; straight edges, surface plates, optical flat and auto collimator.

UNIT-V: LIMITS AND FITS: Introduction, normal size, tolerance limits, deviations, allowance, fits and their types - unilateral and bilateral tolerance system, hole and shaft basis systems - interchangeability and selective assembly. Indian standard Institution system - International Standard system for plane and screwed work.

LIMIT GAUGES: Taylor's principle - Design of GO and NO GO gauge, plug, ring, snap, taper, profile and position gauges.

Text Books:

1. Khanna, O.P., and Lal,M.,A Text book of Production Technology VOL-II, Dhanpat Rai and sons.1992.
2. R. K. Jain and S. C. Gupta, Production Technology , Khanna Pulishers. 16th. Edition, 2001.
3. R. K. Jain, Engineering Metrology , Khanna Publishers, January 2009.

References:

1. Bhattacharya A and Sen. G. C, Principles of Machine Tools, New Central Book Agency. 2nd Revised edition January 2009.
2. C Elanchezhian & M. Vijayan, Machine Tools , Anuradha Publications, 2008.
3. P.N. Rao.,Kundra, T.K.,And Tiwari,N.L.K., Numerical control and computer Aided Manufacturing,Tata McGraw-Hill,2004.
4. Hajra Choudary, Elements of Work Shop Technology - Vol. II , Media Promoters.2010.
5. Connie Dotson, Dimensional Metrology, Thamson 5 edition, November 21, 2006.

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16ME3103-THERMAL ENGINEERING–II

III Year B.Tech, ME, I Semester

L	T	P/D	C
4	1	-/-	4

Pre-requisite: (16ME2101) Thermodynamics
Course Objective:

1. To apply the laws of Thermodynamics to analyze steam turbine cycles
2. To apply the laws of Thermodynamics to analyze gas turbine cycles
3. To perform analysis of the major components of steam turbine plants and their applications.
4. To perform analysis of the major components of gas turbine plants and their applications.
5. To apply the laws of Thermodynamics to analyze rocket engines.

Course Outcomes:

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

CO1	Establish state – space diagrams based on the schematic diagrams of process flow of steam and gas turbine plants
CO2	Apply the laws of Thermodynamics to analyze thermodynamic cycles
CO3	Differentiate between vapour power cycles and gas power cycles
CO4	Apply the data for the evaluation of performance parameters of the steam and gas turbine plants using property charts and tables
CO5	Understand the functionality of major components of steam and gas turbine plants and to do the analysis of these components

Detailed syllabus:

UNIT – I: Steam Power Plant: Rankine cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration & reheating.

Boilers – Classification – Working principles with sketches including H.P.Boilers – Mountings and Accessories – Working principles- Boiler horse power, Equivalent Evaporation, Efficiency and Heat balance – Draught- Classification – Height of chimney for given draught and discharge- Condition for maximum discharge- Efficiency of chimney.

UNIT – II: Steam Nozzles : Stagnation Properties- Function of nozzle – Applications and Types- Flow through nozzles- Thermodynamic analysis – Assumptions -Velocity of nozzle at exit-Ideal and actual expansion in nozzle- Velocity coefficient- Condition for maximum

discharge- Critical pressure ratio- Criteria to decide nozzle shape- Super saturated flow, its effects, Degree of super saturation and Degree of under cooling - Wilson line.

UNIT – III: Steam Turbines: Classification – Impulse turbine; Mechanical details – Velocity diagram – Effect of friction – Power developed, Axial thrust, Blade or diagram efficiency – Condition for maximum efficiency. De-Laval Turbine - its features- Methods to reduce rotor speed-Velocity compounding and Pressure compounding- Velocity and Pressure variation along the flow – Combined velocity diagram for a velocity compounded impulse turbine.

Reaction Turbine: Mechanical details – Principle of operation, Thermodynamic analysis of a stage, Degree of reaction –Velocity diagram – Parson's reaction turbine – Condition for maximum efficiency.

UNIT IV: Steam Condensers: Requirements of steam condensing plant – Classification of condensers – Working principle of different types – Vacuum efficiency and Condenser efficiency – Air leakage, sources and its affects, Air pump- Cooling water requirement.

Gas Turbines: Simple gas turbine plant – Ideal cycle, essential components – Parameters of performance – Actual cycle – Regeneration, Inter cooling and Reheating –Closed and Semi-closed cycles – Merits and Demerits- Combustion chambers and turbines of Gas Turbine Plant- Brief Concepts.

UNIT – V: Jet Propulsion : Principle of Operation –Classification of jet propulsive engines – Working Principles with schematic diagrams and representation on T-S diagram - Thrust, Thrust Power and Propulsion Efficiency – Turbo jet engines – Needs and Demands met by Turbo jet – Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation – Methods.

Rockets: Application – Working Principle – Classification – Propellant Type – Thrust, Propulsive Efficiency – Specific Impulse – Solid and Liquid propellant Rocket Engines.

Text Books:

1. Rajput -Thermal Engineering - Lakshmi Publications – 2016 - 9th Edition.
2. P.L. Ballaney - Thermal Engineering – Khanna Publishers – 20th Edition.
3. Ajoy Kumar - Thermal Engineering – Narosa publishing house – 2007.

Reference Books:

1. P. Khajuria & S. P. Dubey - Gas Turbines and Propulsive Systems - Dhanpatrai Publications – 2012.
2. R. Yadav - Thermodynamics and Heat Engines - Central Book Depot – 2002.
3. V. Ganesan - Gas Turbines – TMH – 2010.
4. M.L.Mathur & F S Mehta - Thermal Engineering - Jain Bros – 2001.

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16ME3104– DESIGN OF MACHINE ELEMENTS –I

III Year B.Tech, ME, I Semester

L	T	P/D	C
4	1	-/-	4

Pre-requisites: 16ME1102 Engineering Mechanics-I, 16ME1201 Mechanics-II, 16ME2102-Mechanics of Solids.

Course Objectives:

1. Develop an ability to apply knowledge of mathematics, science, and engineering.
2. To illustrate to students the variety of mechanical components available and emphasize the need to continue learning.
3. Ability to design a system, component, or process to meet desired needs within realistic constraints.
4. To develop an ability to identify, formulate, and solve engineering problems.
5. To develop an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

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

CO1	Understand the knowledge of material properties, tolerances and theories of failures.
CO2	Identify and calculate the different types of normal and shear stresses of loaded members of mechanical structures and machine elements.
CO3	Apply the above skills to execute original safe and economical designs of machine elements for different types of loading.
CO4	Predict the engineering principles to estimate the actual endurance strength, predictions of failure, and design factors of machine elements for different types of loading.
CO5	Evaluate and Design safe loaded helical and compressions springs.

Detailed Syllabus:

UNIT-I: Introduction: General considerations in the design of Engineering Materials & their properties – selection – Manufacturing consideration in design, Tolerances and fits – BIS codes of steels.

Stresses in Machine Members: Simple stresses – Combined stress – Torsional and Bending stresses – Impact stresses – Stress strain relations – Various theories of failure – Factor of

safety – Design for strength and rigidity – Preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations – Static strength design based on fracture toughness.

Fatigue Loading: Stress concentration – Theoretical stress concentration Factor – Fatigue stress concentration factor notch sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Goodman's line – Soderberg's line – Modified Goodman's line.

UNIT-II: Riveted Joints: Riveted joints: modes of failure of riveted joints, strength equations – efficiency of riveted joints – eccentrically loaded riveted joints.

Welded joints: Design of fillet welds – axial loads – circular welds joints- bending and torsion - eccentrically loaded joints.

Bolted joints – Design of bolts with pre-stresses-Design of joints under eccentric loading-locking devices-both of uniform strength, different seals

UNIT-III: Axially Loaded Joints: Keys, Cotters and Knuckle Joints**:** Design of Keys – stresses in keys – cotter joints – spigot and socket, sleeve and cotter, jib and cotter joints – Knuckle joints.

UNIT-IV: Design of Shaft: Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – shaft sizes – BSI codes

Shaft Coupling: Rigid couplings – Muff, Split muff and Flange couplings. Flexible Couplings – Flange coupling (Modified).

UNIT-V: Mechanical Springs: Stresses and deflections of helical springs-Extension-compression springs-Springs for fatigue loading natural frequency of helical springs-Energy storage capacity-helical torsion springs-Co-axial springs, leaf springs.

Text Books:

1. V.B.Bhandari, Design of Machine Elements ,Tata McGraw Hill 2nd Edn ,2007.
2. Joseph E Shigley and Charles R. Mischke, Mechanical Engineering Design,Tata McGraw-Hill 10th Edition 2014.
3. Dr.N.C.Pandya and C.S.Shah ,Machine design , Charotar Publishing House Pvt. Limited, 2006.

References:

1. R S Khurmi & JK Gupta, Machine Design, S Chand Publications,25th edition,2014.
2. T Krishna Rao, Design of machine elements(Volume 2),I.K International Private Ltd, 2010.
3. S MD Jalaludin, Machine Design, Anuradha Publishers,2004 .
4. T V Soundararajan Murthy and N Shanmugam, Machine design ,Anuradha publishers.
5. Robert. L. Nortan, Machine design ,Prentice Hall PTR,5th edition.

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16MB3121-INTELLECTUAL PROPERTY RIGHTS

(Open Elective – I)

III Year. B. Tech. ME - I Semester

L	T	P/D	C
3	**-**	**-/-**	**3**

Pre-requisites: None

Course objectives: Develop ability to

1. Understand the various concepts, importance and types of intellectual property rights.
2. Discuss the purpose, functions and registration process of trademarks.
3. Analyze the fundamental laws of copy rights and patents.
4. Understand trade secret laws, trade secret litigation and unfair completion.
5. Understand the latest developments in IPR.

Course outcomes (COs):

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

CO1: Acquire knowledge on intellectual property rights

CO2: Know about the acquisition of trademarks.

CO3: Identify the importance of copyrights, patents searching process and transfer of Ownership.

CO4: Know about secret laws, unfair competition, false advertising.

CO5: Reciprocate to new developments of intellectual property rights.

UNIT - I: Introduction to Intellectual property: Concepts, types of intellectual property, international organizations, agencies and treaties, and importance of intellectual property rights.

UNIT - II: Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

UNIT - III: Law of Copy Rights: Fundamentals of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right laws.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.

UNIT - IV: Trade Secrets: Trade secrete law, determinations of trade secrete status, liability for misappropriations of trade secrets, protections for submission, trade secrete litigation. Unfair competition-misappropriation right of publicity, false advertising.

UNIT - V: Latest development of intellectual property Rights: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international - trade mark law, copy right law, international patent law, and international development in trade secrets law.

Text Books

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, Prabuddha Ganguli, Tata Mc Graw Hill Publishing Company Ltd.
3. Cornish, William Rodolph & Llewelyn, David. Intellectual property: patents, copyright, trademarks and allied rights. Sweet & Maxwell, 8/e, 2013.

References

1. Cornish, William Rodolph. Cases and materials on intellectual property. Sweet & Maxwell, 5/e, 2006.
2. Lo, Jack and Pressman, David. How to make patent drawings: a patent it yourself companion. Nolo, 5/e 2007.

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16EE3122 – INDUSTRIAL SAFETY AND HAZARDS

(Open Elective – I)

L	T	P/D	C
3	-	-/-	3

III Year B.Tech. ME - I Semester

Course Objectives:

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

1. Determine responsibility for safety in the workplace.
2. Learn to recognize workplace hazards.
3. Learn how to develop procedures to eliminate of lessen those hazards.
4. Apply basic Federal and State Safety Rules to the workplace.

Course Outcomes (COs):

CO1.Understand the fundamental concepts of accident prevention with a basic knowledge of safe work rules designed to promote an accident free workplace.

CO2. Understand the relief systems.

CO3. Understand the electrical hazards and safety handling of equipments.

CO4. Understand the effects of momentum and buoyancy.

CO5. Understand different case studies.

UNIT I: FIRE AND EXPLOSION: Introduction-Industrial processes and hazards potential, mechanical electrical, thermal and process hazards. Safety and hazards regulations, Industrial hygiene. Factories Act, 1948 and Environment (Protection) Act, 1986 and rules thereof. Shock wave propagation, vapour cloud and boiling liquid expanding vapours explosion (VCE and BLEVE), mechanical and chemical explosion, multiphase reactions, transport effects and global rates.

UNIT II: RELIEF SYSTEMS: Preventive and protective management from fires and explosion-inerting, static electricity passivation, ventilation, and sprinkling, proofing, relief systems –relief valves, flares, scrubbers.

UNIT III: ELECTRICAL HAZARDS: Primary and secondary hazards-shocks, burns, scalds, falls-human safety in the use of electricity. Energy leakage-clearances and insulation-classes of insulation-voltage classifications excess energy-current surges-Safety in handling of war equipments-over current and short circuit current-heating effects of current-electromagnetic forces-corona effect-static electricity –definition, sources, hazardous conditions, control, electrical causes of fire and explosion-ionization, spark and arc-ignition energy-national electrical safety code ANSI. Lightning, hazards, lightning arrestor, installation–earthing, specifications, earth resistance, earth pit maintenance.

UNIT – IV: LEAKS AND LEAKAGES: Spill and leakage of liquids, vapors, gases and their mixture from storage tanks and equipment; Estimation of leakage/spill rate through hole, pipes and vessel burst; Isothermal and adiabatic flows of gases, spillage and leakage of flashing liquids, pool evaporation and boiling; Release of toxics and dispersion. Naturally buoyant and dense gas dispersion models; Effects of momentum and buoyancy; Mitigation measures for leaks and releases.

UNIT V: CASE STUDIES: Flixborough, Bhopal, Texas, ONGC offshore, HPCL Vizag and Jaipur IOC oil-storage depot incident; Oil, natural gas, chlorine and ammonia storage and transportation hazards.

Text Books

1. Fordham Cooper, W., "Electrical Safety Engineering" Butterworth and Company, London, 1986.

Reference Books

1. Crowl D.A. and Louvar J.F., "Chemical Process Safety: Fundamentals with Applications", 2nd Ed., Prentice Hall.2001
2. Mannan S., "Lee's Loss Prevention in the Process Industries", Vol.I, 3rdEd., Butterworth-Heinemann.2004.
3. Mannan S., "Lee's Loss Prevention in the Process Industries", Vol.II, 3rdEd., Butterworth-Heinemann.2005.
4. Indian Electricity Act and Rules, Government of India.
5. Power Engineers –Handbook of TNEB, Chennai, 1989.
6. Martin Glov Electrostatic Hazards in powder handling, Research Studies Pvt.LTd., England,1988.

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16CS3123 – JAVA PROGRAMMING

(Open Elective - I)

L	T	P/D	C
3	-	-/-	3

III Year B.Tech, ME, I Semester

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand basic concepts of object oriented programming.
2. Understand the primitive data types built into the Java language and features of strongly typed language.
3. Understanding scope, lifetime, and the initialization mechanism of variables and parameter passing mechanisms.
4. Understand file streams and database connectivity using Java language

Course Outcomes (COs)

After completion of the course, student would be able to

CO1. Apply the concepts of OOPs in problem solving.

CO2. Use data abstraction, inheritance, polymorphism, encapsulation and method overloading principles in structuring computer applications.

CO3. Identify classes, objects, members of a class and relationships among them needed for a specific problem.

CO4. Use Java standard class library with necessary exception handling mechanisms in constructing computer applications.

CO5. Develop java programs using multi-threading, files and database concepts and their connectivity.

UNIT-I: Object Oriented Characteristics - Data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, classes and objects, procedural and Object oriented programming paradigms.

Java Programming - History of Java, comments, data types, variables, constants, scope and life time of variables.

UNIT-II: Operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow block scope, conditional statements, loops break and continue statements. simple java program, arrays, console input and output, formatting output, constructors, methods, parameter passing, static fields and methods, access control, this keyword, overloading methods and constructors recursion, garbage collection, building strings, exploring string class.

UNIT-III: Interfaces - Interfaces vs. Abstract classes, defining an interface, implementing interfaces, accessing implementations through interface references, extending interface.

Inner classes - Uses of inner classes, local inner classes, anonymous inner classes, static inner classes, examples.

Packages - Definition, Creating and Accessing a package, understanding CLASSPATH, importing packages.

UNIT –IV: Exception handling – Dealing with errors, benefits of exception handling, the classification of exceptions- exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes.

Multi-Threading - Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter thread communication, producer consumer pattern.

UNIT –V: Files: streams – byte streams, character streams, text input/ Output binary input/ output

Random access file operations, file management using File class.

Connecting to Database - JDBC type 1 to 4 drivers, connecting to a data base, querying a data base and processing the results, updating data with JDBC.

TEXT BOOK(S)

1. Java fundamentals- A comprehensive Introduction, Herbert Schildt and Dale Skrien, TMH, 1st Edition, 2013.

REFERENCE BOOK(S)

1. Core Java 2–Volume1, Cay S. Horstmann and Gary Cornell
2. Java for Programmers, PJ. Dietel and H.M Deitel Pearson education.
3. Object Oriented Programming through Java. P.Radha Krishna. Universities Press.
4. Thinking in Java, Bruce Eckel, Pearson Education.

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16EC3124 - Electronic Measuring Instruments

(Open Elective- I)

III Year B.Tech. ME - I Sem

L	T	P/D	C
3	-	-/-	3

Prerequisite: Nil

Note: No detailed mathematical treatment is required.

Course Objectives:

1. It provides an understanding of various measuring systems functioning and metrics for performance analysis.
2. Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
3. Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes:

On completion of this course, Students would be able to

1. Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
2. Measure various physical parameters by appropriately selecting the transducers.
3. Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

Unit I: Block Schematics of Measuring Systems and Performance Metrics: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag.

Unit II: Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, and Specifications.

Unit III: Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments. CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes.

Unit IV: Recorders: X-Y Plotter, Curve tracer, Galvanometric Recorders, Servo transducers, pen driving mechanisms, Magnetic Recording, Magnetic recording techniques.

Unit V: Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

TEXT BOOKS:

1. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage, TMH Reprint 2009.
2. Electronic Instrumentation: H.S.Kalsi – TMH, 2nd Edition 2004.

REFERENCES:

1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI 5th Edition 2003.
3. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
4. Industrial Instrumentation: T.R. Padmanabham Springer 2009.

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16CE3126– GLOBAL WARMING AND CLIMATE CHANGE

(Open Elective – I)

III Year. B.Tech. ME– I Semester.

L	T	P/D	C
3	-	-/-	3

Prerequisite(s): None.

Course Objectives:

Develop ability to

1. Understand the importance of Ozone layer in the atmosphere.
2. Comprehend composition of atmosphere.
3. Understand impacts of climate change on ecosystem.
4. Understand initiatives taken by different countries to reduce emission of greenhouse gases.
5. Know measures to mitigate greenhouse gases.

Course Outcomes:

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

CO 1: Define greenhouse gases and their influence on global warming.

CO 2: Explain physical and chemical characteristics of atmosphere and structure of atmosphere. CO 3: Explain impacts of climate change on agriculture, forestry and ecosystem.

CO 4: Explain initiatives taken by countries to reduce global warming.

CO 5: Suggest mitigation measures taken to reduce global warming and climate change.

Syllabus:

UNIT–I: Earth's Climate System: Role of ozone in environment - Ozone layer – Ozone depleting gases – Green House Effect – Radioactive effects of Greenhouse gases – The Hydrological cycle – Green House Gases and Global Warming – Carbon Cycle.

UNIT–II: Atmosphere and Its Components: Importance of Atmosphere – Physical and chemical characteristics of Atmosphere – Vertical structure of the atmosphere – Composition of the atmosphere – Atmospheric stability – Temperature profile of the atmosphere – Lapse rates – Temperature inversion – Effects of inversion on pollution dispersion.

UNIT–III: Impacts of Climate change: Causes of Climate change: Changes of Temperature in the environment – Melting of ice pole – sea level rise – Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for different regions – Uncertainties in the projected impacts of Climate Change – Risk of Irreversible Changes.

UNIT–IV: Observed changes and its Causes: Climate change and Carbon credits – CDM – Initiatives in India-Kyoto Protocol – Paris Convention - Intergovernmental Panel on Climate change – Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC – Global Climate Models (GCM) - Evidences of Changes in Climate and Environment- on a Global scale and in India.

UNIT–V: Climate change and mitigation measures: Clean Development Mechanism – Carbon Trading – Examples of future clean technology – Biodiesel – Natural Compost – Eco-friendly plastic – Alternate Energy – Hydrogen – Bio-fules – Solar Energy – Wind – Hydroelectric Power – Mitigation Efforts in India and Adaptation funding. Key Mitigation Technologies and Practices – Energy Supply – Transport – Buildings – Industry – Agriculture – Forestry – Carbon sequestration – Carbon capture and storage (CCS) – Waste (MSW & Bio-waste, Biomedical, Industrial waste) – International and Regional cooperation.

Text Books:

1. "Climate Change – An Indian Perspective", Dash Sushil Kumar, Cambridge University Press Pvt Ltd, 2007.
2. Adaptation and mitigation of climate change – Scientific Technical Analysis, Cambridge Unviersity Press, Cambridge, 2006.

Reference Books:

1. Atmospheric Science, J.M. Wallace and P.V Hobbs, Elsevier/ Academic Press, 2006.
2. "Climate Change and Climate Variability on Hydrological Regimes", Jan C. Van Dam, Cambridge University Press, 2003.

http://www.ipcc.ch/

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16ME31L1- THERMAL ENGINEERING LAB

L	T	P/D	C
-	-	3/-	2

III Year B.Tech, ME - I Semester

Pre-Requisite: Thermodynamics, Thermal Engineering-I and Thermal Engineering-II

Course Objective:

To understand the working principles of IC Engines, Compressors, Steam power plants.

Course Outcomes:

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

CO1	Test the performance to improve the efficiency of the engines, develop mathematical models for study on computer systems.
CO2	Improve their techniques to compress air, by enhancing cooling procedures to adhere to isothermal compression process.
CO3	Develop the concepts of valve timing diagram and port timing diagram paves way for development of a computerized model to make a study at different speeds for optimum performance.
CO4	Understand the concepts of models of boilers which give picture as to what to expect in real life versus quantum of steam generated plus safety procedures to be followed, design and maintenance methods in vogue.

Detailed Syllabus:

1. I.C. Engines Valve / Port Timing Diagrams
2. I.C. Engines Performance Test for 4 Stroke SI engines
3. I.C. Engines Performance Test for 2 Stroke SI engines
4. I.C. Engines Morse, Retardation, Motoring Tests
5. I.C. Engines Heat Balance – CI/SI Engines
6. I.C. Engines Economical speed Test on a SI engine
7. I.C. Engines effect of A/F Ratio in a SI engine

8. Performance Test on Variable Compression Ratio Engine
9. IC engine Performance Test on a 4S CI Engine
10. Performance Test on Reciprocating Air – Compressor Unit
11. Dis-assembly / Assembly of Engines
12. Study of Boilers

Additional Experiments

1. Mechanical efficiency of 2-stage reciprocating compressor.
2. Performance test on three cylinder four stroke petrol engine.

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16ME31L2- Production Technology-II Lab

III Year B.Tech, ME - I Semester

L	T	P/D	C
-	-	3/-	2

Pre-requisites: Engineering Workshop

Course Objectives:

1. To Impart students with The Knowledge of various machine tools and its operations .
2. To familiarize with the selection of suitable production process for the desire components.

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

CO1	Explain the working principle of various machines used in manufacturing.
CO2	Identify The appropriate production process and machines.
CO3	Demonstrate the working of common machine tools like Lathe ,shaper, miller, grinder etc.
CO4	Describe The Use of metrology instruments.

Section - A: Machining

1. Introduction of machine tools - Lathe, Drilling machine, Milling machine, Shaper, Planing machine, slotting machine, Cylindrical Grinder, surface grinder and tool and cutter grinder.
2. Step turning and taper turning on lathe machine.
3. Thread cutting and knurling on -lathe machine.
4. Drilling and Taping.
5. Shaping and Slotting
6. Planing
7. Milling
8. Cylindrical and Surface Grinding.

Additional Experiments

1. Grinding of tool angles.
2. Slotting using Indexing.

Section - B: Metrology

1. Use of gear teeth vernier calipers for checking the chordal addendum and chordal height of the spur gear.
2. Tool makers microscope and its application
3. Angle and taper measurements by bevel protractor and sine bars.
4. Use of spirit level and optical flats in finding the flatness of surface plate.
5. Thread measurement by 2-wire and 3-wire methods.

Additional Experiments

1 .Surface finish Measurement.

2. Machine tool alignment - test on the lathe.

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16EN31L1- ADVANCED ENGLISH COMMUNICATION SKILLS LAB

III Year B.Tech, ME, I Semester

L	T	P/D	C
-	-	3/-	2

Prerequisite(s):16EN1101- English - I

16EN11L1English Lab

16EN1201English- II

Course Objectives:

Develop ability to

1. Improve fluency in English through well developed vocabulary exercises.
2. Listen to conversational English language spoken by native English speakers and respond appropriately in different social, cultural and professional contexts.
3. Communicate ideas relevantly, coherently and cogently in written form, presentations and interviews.

Course Outcomes:

On completion of this course, student would be able to

CO 1: Take part in social and professional communication with ease.

CO 2: Improve vocabulary and express the same contextually.

CO 3: Demonstrate reading techniques namely, skimming and scanning.

CO 4: Write formal letters prepare resume, and reports: project and technical reports.

CO 5: Make presentations.

CO 6: Participate in group discussions expressing ideas relevantly, coherently and cogently.

Syllabus

The following course content with activities/tasks is prescribed for the Advanced Communication Skills (ACS) Lab sessions:

1. **Activities on Fundamentals of Inter- Personal Communication and Building Vocabulary – Starting a conversation** – responding appropriately and relevantly- using the right body language- role play in different situations, discourse skills- using audio-visual aids, synonyms and antonyms word roots, one-words substitutions, prefixes and suffixes, study of word origins, business vocabulary, analogy, idioms and phrases, collocations and uses of vocabulary.
2. **Activities on Reading Comprehension**- General Vs Local Comprehension reading for facts, guessing meanings from contexts. Scanning, skimming, and inferring meaning, critical reading, and effective goggling.

3. **Activities on Writing Skills-** Structure and presentation of different types of writing – Letter writing / Resume Writing / e-correspondence / technical report writing/ portfolio writing/ planning for writing / improving writing skills.
4. **Activities on Presentations Skills**- Oral presentations (individual and group) through **JAM** sessions / seminars / **PPT** s and written presentations through Posters/ Projects/ Reports/ e-mails assignments etc.
5. **Activities on Group Discussion and Interview Skills-** Dynamics of group discussion, intervention, summarizing, modulation of voice body language, relevance fluency and organization of ideas and rubrics for evaluation/ Concept of process. Pre- interview planning opening strategies, answering strategies interview through Tele – Conference andVideo –Conference and Mock Interviews.

Books recommended

1. *Technical communication* by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2009.
2. *Advanced Communication Skills Laboratory Manual* by Sudha Rani, D,Pearson Education 2011.
3. *Technical Communication* by Paul .V. Anderson. 2007. CENGAGE Learning pvt ltd New Delhi.
4. *Business and Professional Communication by Keys for Work place Excellence* by Kelly M Quintanillaand Shawn T. Wahi . Sage South Asia Edition. Sage publication .2011.
5. *The Basics of Communications: A Relational Perspective* by Steve Duck and David T. McMahan. Sage South Asia Edition. Sage Publications 2012.
6. *English Vocabulary in Use* series, Cambridge University Press 2008.
7. *Management Shapers Series* by Universities Press (India) Pvt Ltd., Himayath Nagar Hyderabad 2008.
8. *Handbook for Technical Communication* by David A Mc Murrey and Jaoanne Buckely 2012. CENGAGE learning.
9. *Communication Skills* by Leena Sen , PHI Learning pvt ltd, New Delhi 2009.
10. *Handbook for Technical Writing* by David A Mc Murrey and Joanne Buckely CENGAGE learning 2008.
11. *Job hunting* by Colm Downes , Cambridge University Press 2008.
12. *Master Public Speaking* by Anne Nicholls, JAICO Publishing House, 2006.
13. *English for Technical Communication for Engineering Students* by Aysha Viswamohan, Tata Mc Graw- Hill 2009.
14. Books on TOEFL/ GRE/GMAT/CAT/ IELTS by Barron's / DELTA / Cambridge University Press.
15. *International English for Call Centers* by Barry Tomalin and Suhashini Thomas, Macmillanpublishers2009.

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16ME3201 - DYNAMICS OF MACHINERY

III Year B Tech. ME - II Semester

L	T	P/D	C
3	1	-/-	3

Prerequisite(s): 16ME1102 Engineering Mechanics –I,
16ME1201 Engineering Mechanics – II

Course Objectives: Develop ability to

1. Impart basic knowledge about the motion, forces and torques involved in different machine members.
2. Facilitate to understand the theory involved in the analysis of brakes and dynamometers
3. Predict the dynamic behavior principles and operations of flywheels and governors.
4. Aware of situations like speed fluctuations, rotor imbalance and machine vibration which appears in industry.
5. Demonstrate free and forced vibration of single and multi-degree of freedom systems.

Course Outcomes (COs):

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

CO1	Analyze the gyroscopic effects in ships, aero planes and road vehicles.
CO2	Apply basic laws of friction to brakes and dynamometers.
CO3	Describe the operations and perform basic analysis of flywheel and governors.
CO4	Perform static and dynamic balancing calculations for rotating and reciprocating machinery.
CO5	Understand longitudinal, transverse and torsional vibrations so as to avoid resonance.

Syllabus

UNIT - I: PRECESSION: Gyroscopes – effect of precession – motion on the stability of moving vehicles such as motorcycle – motorcar – aeroplanes and ships.

STATIC AND DYNAMIC FORCE ANALYSIS: Static force analysis of planar mechanisms – Analytical Method – Dynamic Force Analysis – D'Alembert's principle, Dynamic Analysis of 4-link mechanism, Slider Crank Mechanism.

UNIT - II: SYNTHESIS OF LINKAGES: Three position synthesis-Four position synthesis-precision positions-structural error,Chebychev's spacing,Freudentein's equation, Problems.

BRAKES AND DYNAMOMETERS: Simple block brake - pivoted block or shoe brake-differential band brake-Internal expanding brake -band brake of vehicle. Dynamometers - absorption and transmission types, General description and methods of operation.

UNIT - III:TURNING MOMENT DIAGRAM AND FLYWHEELS: Turning moment-Inertia torque- connecting rod angular velocity and acceleration-crank effort and torque diagrams-fluctuation of energy - flywheels

GOVERNORS: Watt, Porter and Proell governors- Spring loaded governors - Hartnell and Hartung with auxiliary springs- Sensitiveness, isochronisms and hunting- effort and power of the governors.

UNIT - IV: BALANCING: Balancing of rotating masses- Primary, Secondary, and higher balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples. Examination of "V" and multi cylinder inline and radial engines for primary and secondary balancing- locomotive balancing - Hammer blow - Swaying couple - variation of tractive effort.

UNIT - V: VIBRATIONS: Free Vibration of mass attached to vertical spring - oscillation of pendulums- Transverse loads - vibrations of beams with concentrated and distributed loads. Dunkerly's method - Raleigh's method. Whirling of shafts - critical speed - torsional vibrations - one, two and three rotor systems. Vibrations of spring mass damper system under harmonic excitation. Magnification Factor. Phase difference between excitation and motion. Dependence of Magnification Factor and Phase difference on frequency of excitation.

Text Books:

1. S. S. Rattan, Theory of Machines, TMH Publishers, Third Edition ,2009.
2. **John J. Uiker, Joseph E. Shigley,** Theory of Machines and Mechanisms, McGraw Hill Publishers, 4th Edition,2003.

Reference Books:

1. P.L.Ballaney, Theory of Machines, Khanna Publishers,2001.
2. R. S. Khurmi, J. K. Gupta, Theory of machines, S. Chand Publications, 2010.
3. Thomas Bevan, Theory of Machines, CBS Publishers, Third Editon,2002.
4. J.S. Rao and R.V. Dukkipati, Mechanisms and Machine Theory, NAI Publishers, 2006.
5. Sadhu Singh, Theory of Machines, Pearson Education, 2006.
6. JagdishLal ,Theory of Mechanisms and Machines, Metropolitan Publishers, 2002 .

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16ME3202– DESIGN OF MACHINE ELEMENTS –II

III Year B Tech. ME - II Semester

L	T	P/D	C
3	1	-/-	3

Pre-requisites: 16ME1102 Engineering Mechanics-I,
16ME1201 Engineering Mechanics-II,
16ME2102 Mechanics of Solids.

Course Objectives: Develop ability to

1. Provide enough hands on experience with the usage of design data book to design standard machine elements like bearings, gears and other elements.
2. Apply the concepts of stress analysis, theories of failure and material science to analyze, design and/or select commonly used machine components.
3. Develop an ability to design a system, component, or process to meet desired needs within realistic constraints.
4. Identify, formulate, and solve engineering problems.
5. Apply mechanical engineering design theory to identify and quantify machine elements in the design of commonly used mechanical systems.

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

CO1	Analyze the pressure distribution and design journal bearings.
CO2	Design IC engine parts and calculate forces in piston and crank shaft.
CO3	Model Power transmission systems and pulleys
CO4	Design the different gears against static and dynamic loads and their analysis
CO5	Design Power screws

Detailed Syllabus:

UNIT-I: BEARINGS: Types of Journal bearings, bearing materials , Lubrication , Bearing Modulus. Full and partial bearings - Clearance ratio , Heat dissipation of bearings, journal bearing design.

BALL AND ROLLER BEARINGS – Static load, dynamic load, equivalent radial load, Design and selection of ball and roller bearings.

UNIT-II: DESIGN OF IC ENGINE PARTS: Connecting Rod - Thrust in connecting rod , stress due to whipping action on Connecting rod ends. Cranks and Crank shafts - strength and proportions of over hung and center cranks , Crank pins. Pistons- Forces acting on piston, Design and proportions of piston.

UNIT-III: POWER TRANSMISSION SYSTEMS AND PULLEYS:

Materials, Transmission of power by Belt and Rope ways, Transmission efficiencies, Types of Belts and Belt Drives , Ropes , Design of Pulleys for belt and rope drives, Chain drives.

UNIT-IV: SPUR, HELICAL, BEVEL GEAR DRIVES: Design of Spur gear , Helical and bevel gears - Load concentration factor- Dynamic load factor, Analysis of spur , helical and bevel gears, check for plastic deformation, Dynamic and wear considerations.

DESIGN OF WORM GEARS: Properties of worm gears, selection of materials, strength and wear rating of worm gears, force analysis, friction in worm gears.

UNIT-V: DESIGN OF POWER SCREWS: Design of screw, Design of nut, Compound screw, Differential screw, Ball screw- Possible failures.

Text Books:

1. V.B.Bhandari, Design of Machine Elements , , TataMcgraw hill , 2nd Edn 2007

2. Joseph E Shigley and Charles R. Mischke, Mechanical Engineering Design, 8th Edition Tata McGrawhill, 2008.

Design Data Hand Books :

1.Design Data hand Book, S MD Jalaludin, Anuradha Publishers.

2. Design Data Hand Book – K.Lingaiah, Mcgraw hill, 2nd Ed 2003.

3. Design Data Hand Book – K.Mahadevan and Balaveera reddy, Cbs Publishers & Distributors.

References:

1. Pandya and shah, Machine Design, Charotar Publishing House Pvt. Ltd.19th edition, 2014.

2. Robert L.Norton, Machine Design:, Pearson Education,2001.

3. Robert C. Juvinall, Fundamentals of Machine component Design, Wiley India Pvt.Ltd, 3rd Edn, 2007.

4. MD Jalaludine, Machine Design, Anuradha Publishers, 2015.

5. R S Khurmi and J K Gupta, Machine Design, S Chand Publisher, 2005.

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I6ME3203 – FINITE ELEMENT METHODS

III Year B Tech. ME - II Semester

L	T	P/D	C
3	-	-/-	3

Pre-requisites: Engineering Mechanics, Mechanics of solids.

Course Objectives:

Develop ability to

1. An approach of beginning with a review of differential equations, boundary conditions, integral forms, interpolation, parametric geometry, numerical integration, and matrix algebra.
2. Develop engineering applications to field analysis, stress analysis and vibrations are introduced. Time dependent problems are also treated.
3. Develop students by means of selected tutorials, to the commercial finite element system Solid Works which is similar to one they could be expected to use upon graduation.
4. Develop the more powerful (and difficult to use) in any analysis software system.

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

CO1	Define the shape of the object in small possible regular shapes and their stress strain relations and as well as one dimensional problems.
CO2	Analyze the truss and beam elements.
CO3	Evaluate 2D plane elements and axisymetric Solids
CO4	Perform Heat Transfer Analysis
CO5	Formulate Dynamic Analysis and solve the problems by using softwares.

Detailed Syllabus:

UNIT I: Introduction of FEM for solving field problems. Stress and equilibrium. Boundary conditions. General description, comparison of FEM with other methods. Basic equations of elasticity, Strain displacement relations, Stress strain relations for 2D and 3D Elastic problems.

One dimensional problems: Finite Element modeling, coordinates and shape functions. Stiffness equations for axial bar element using potential energy approach. Assembly of global stiffness matrix and load vector, Finite Element equations. Quadratic shape functions.

UNIT II: Analysis of Truss: Stiffness stiffness matrix for plane truss elements, Stress calculations and problems.

Analysis of Beams: Shape functions, Element stiffness matrix for two noded, two degree of freedom per node beam element and simple problems.

UNIT III: 2D-problems: Finite element modeling of two dimensional stress analysis with CST, and treatment of boundary conditions. Estimation of load vector, Stresses.

Finite element modeling of Axi symmetric solids subjected to Axisymmetric loading with triangular elements. Two dimensional four nodded isoparametric elements.

UNIT IV: Steady state Heat transfer Analysis: One dimensional analysis of Slab, fin and two dimensional analysis of thin plate. Analysis of uniform shaft subjected to torsion.

UNIT –V: Dynamic analysis: Formulation of finite model, Element mass matrices**,** equations of Eigen values and Eigen vectors for a stepped bar.

Finite element Formulation of 3D problems in stress analysis, convergence requirements, mesh generation, techniques such as semi automatic and fully Automatic use of software's such as ANSYS, ABAQUS, NASTRAN.

TEXT BOOKS:

1. Chandraputla, Ashok and Belegundu, Introduction to Finite Elements in Engineering , Prentice - Hall.
2. S.Md. Jallaludeen, Introduction to Finite Element Analysis, Anuradha Publications.

REFERENCES :

1. JN Reddy, An introduction to Finite Element Method, TMH
2. Daryl L Logan, A first course in Finite Element Method, Cengage Learning
3. SS Rao , The Finite Element Methods in Engineering , Pergamon.
4. Alavala ,Finite Element Methods: Basic concepts and applications/PHI
5. Kenneth H. Huebner, Donald L. Dewhirst, Douglas E. Smith and Ted G. Byrom , The Finite Element Method for Engineers, John Wiley & sons (ASIA) Pte Ltd.
6. David V Hutton, Fundamentals of Finite element analysis, TMH
7. C.S.Krishna Murthy/ Finite Element Analysis, TMH
8. Bathe/Finite Element Analysis/ PHI

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16ME3204– CAD/CAM

(Soft Core Elective- I)

III Year B.Tech, ME - II Semester

L	T	P/D	C
3	-	-/-	3

Pre-requisites: Engineering Drawing with Auto CAD

Course Objectives:

The course examines the area that is commonly referred to as CAD/CAM. The general objectives of the course are to enable the students to:

1. Understand the basic analytical fundamentals that are used to create and manipulate geometric models in a computer program.
2. Understand the possible applications of the CAD/CAM systems in motion analysis, structure analysis, optimization, rapid prototyping, reverse engineering and virtual engineering.
3. Implement CNC programs for milling and turning machining operations.
4. Create a computer aided manufacturing (CAM) model and generate the machining codes automatically using the CAM system and manual part programming.
5. Integrate the CAD system and the CAM system by using the CAD system for modeling design information and converting the CAD model into a CAM model for modeling the manufacturing information.
6. Use full scale CAD/CAM software systems designed for geometric modeling of machine components and automatic generation of manufacturing information.

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

CO1	Describe the fundamental theory and concepts of the CAD/CAM.
CO2	Develop the concepts and underlying theory of modeling and the usage of models in different engineering applications.
CO3	Describe the principles of Computer Aided Designing systems and the concepts of Geometric modeling, solid modeling, and feature-based design modeling.
CO4	Explain the basic concepts of CNC programming and machining. Compare and distinguish the difference between the operation and programming of a CNC machine tool using manual programming and using CAM systems.
CO5	Describe the basic concepts on CAPP, MRP and CIM.

Detailed Syllabus:

UNIT-I: Introduction: Fundamentals of CAD/CAM, Automation , design process, Application of computers for design, Benefits of CAD, Computer configuration for CAD applications, Computer peripherals for CAD, Design workstation, Graphic terminal, CAD software- definition of system software and application software, CAD database and structure.

Geometric Modeling- Wire frame modeling, wire frame entities and their definitions, Interpolation and approximation of curves, Concept of parametric and non-parametric representation of curves, Curve fitting techniques, definitions of cubic spline, Bezier and B-spline.

UNIT-II: Surface modeling: Algebraic and geometric form, Parametric space of surface, Blending functions, parameterization of surface patch, Subdividing, Cylindrical surface, Ruled surface, Surface of revolution Spherical surface, Composite surface, Bezier surface. B-spline surface, Regenerative surface and pathological conditions.

Solid Modelling: Definition of cell composition and spatial occupancy enumeration, Sweep representation, Constructive solid geometry, Boundary representations.

UNIT-III: NC Control Production Systems : Numerical control, Elements of NC system, NC part programming - Methods of NC part programming, Manual part programming, Computer assisted part programming, Post Processor, Computerized part program, SPPL (A Simple Programming Language), CNC, NC and Adaptive Control Systems.

UNIT-IV: Group Technology: Part families, Parts classification and coding. Production flow analysis, Machine cell design.

Computer Aided Process Planning: Difficulties in traditional process planning, retrieval type and generative type, Machinability data systems.

Computer Aided Manufacturing Resource Planning: Material resource planning inputs to MRP, MRP output records, Benefits of MRP, Enterprise source planning, Capacity requirements planning.

UNIT-V: Flexible Manufacturing System: F.M.S equipment, FMS layouts, Analysis methods for FMS, benefits of FMS.

Computer Aided Quality Control: Automated inspection- Off-line, On-line, contact, Non-contact; Coordinate measuring machines.

Computer Integrated Manufacturing: CIM system, Benefits of CIM.

Text Books:

1. Groover M.P.I, CAD/CAM / Pearson education,1st edition,2003.
2. Alavala, CAD/CAM Concepts and Applications/ PHI,2013.
3. Ibrahim Zeid, CAD /CAM Theory and Practice, TMH,2nd edition,2009.

Reference Books:

1. P.N.Rao, CAD/CAM Principles and Applications, TMH,3rd edition, 2013.
2. P.Radhakrishnan and Subramanian, CAD / CAM / CIM, New Age, 4th edition 2016
3. Farid Amirouchel, Principles of Computer Aided Design and Manufacturing, Pearson,2nd edition,2004.
4. Warren S Seames, Computer Numerical Control Concepts and programming, Thomson,2001.

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16ME3205 - DESIGN FOR MANUFACTURING

(Soft Core Elective–I)

L	T	P/D	C
3	-	-/-	3

III Year B.Tech, ME - II Semester

Pre-requisites: Metallurgy and Material Science, Production Technology I and II

Course Objectives:

1. Understand modern manufacturing operations, including their capabilities, limitations, and how to design for lowest cost.
2. Learn how to analyze products and be able to improve their manufacturability.
3. Understand the relationship between customer desires, functional requirements, product materials, product design, and manufacturing process selection.
4. Be able to examine a product and determine how it was manufactured and why.

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

CO1	Apply data analytic principles relevant to mechanical design
CO2	Communicate a design and its analysis (written, oral, and graphical forms)
CO3	Analyze and refine the design of electro-mechanical devices
CO4	Create useful parametric solid models of simple elements and systems
CO5	Justify the implications of the alternate designs developed

Detailed Syllabus:

UNIT-I: Introduction: Overview of the course Design for manufacturing, Concept generation and evaluation, Typical case studies, Innovative product and service designs.

Material Selection: Properties of Engineering materials, Systematic selection of materials, Selection of Shapes, Co-selection of materials and shapes.

UNIT-II: Selection of Manufacturing Processes: Review of Manufacturing Processes.

Design for Casting: Design of pattern and gating system, Sand casting alloys, Design rules for sound casting, Cost estimation, Design guidelines for special casting processes.

Design for Bulk deformation processes: Characteristics of different Bulk deformation processes die cost estimation, die life and tool replacement costs, selection of proper process for easy manufacturing.

UNIT-III: Design for Sheet Metal Forming: Press selection, design for minimum work done, decision of optimum sequence of operation.

Design for Machining: Selection of required machining process, cost estimation of machined components, decision of optimum process parameters in machining.

Design for Powder Metallurgy Process: Selection of tooling and presses for compaction and sintering, heat treatments, Design guidelines.

UNIT-IV: Design for Assembly: Review of Assembly processes, selection of proper assembly sequence, analysis of assembly requirements, Design for welding, Design for Brazing and Soldering, Design for adhesive bonding, Design for joining of Polymers, design to reduce distortions during assembly.

UNIT-V: Design for Reliability and Quality: Failure mode and effect analysis, Design for Quality, Design for reliability, Approaches to Robust Design.

Text Book:

1. G.Boothroyd, P.Deqhurst and W Knight, "Product Design for Manufacturing and assembly", John Wiley, NY:Marcel Dekkar, 1994.

References:

1. M F Ashby and K Johnson, "Materials and Design- the art and science of material selection in product design", Butterworth-Heinemann, 2003.
2. G Kieter, "Engineering Design- a materials and processing approach", McGraw Hill, NY, 2000.
3. K G Swift and J D Booker, "Process selection: from design to manufacture", London: Arnold, 1997.
4. S S Rao, "Engineering Optimization: Theory and Practice", John Wiley, NY, 1996.
5. J G Bralla, "Handbook for Product Design for Manufacture", McGraw Hill, NY, 1998.
6. ASTM Design handbook.

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16ME3206 - DESIGN AND ANALYSIS OF EXPERIMENTS

(Professional Elective –I)

L	T	P/D	C
3	-	-/-	3

III Year B.Tech, ME - II Semester

Pre-requisites: None

Course Objectives:

1. The course introduces the logic, application, and interpretation of analysis of variance (ANOVA) models.
2. Emphasis will be placed on gaining a conceptual understanding of the statistical tests and their application to research.

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

CO1	Identify objectives and key factors in designing experiments
CO2	Develop appropriate experimental design to conduct experiments.
CO3	Analyze experimental data and draw valid conclusions.
CO4	Develop empirical models using experimental data to optimize process parameters.
CO5	Design robust products and processes using parameter design approach.

Detailed Syllabus:

UNIT-I: Fundamentals of Experimentation: Role of experimentation in rapid scientific progress, Historical perspective of experimental approaches, Steps in experimentation, Principles of experimentation.

UNIT-II: Simple Comparative Experiments: Basic concepts of probability and statistics, Comparison of two means and two variances, Comparison of multiple (more than two) means and ANOVA.

UNIT-III: Experimental Designs: Factorial designs, fractional factorial designs, orthogonal arrays, standard orthogonal arrays & interaction tables, modifying the orthogonal arrays, selection of suitable orthogonal array design, analysis of experimental data.

UNIT-IV: Response Surface Methodology: Concept, linear model, steepest ascent, second order model, regression.

UNIT-V: Taguchi's Parameter Design: Concept of robustness, noise factors, objective function & S/N ratios, inner-array and outer-array design, data analysis.

Text Books:

1. Montgomery DC, Design and Analysis of Experiments, 7th Edition, John Wiley & Sons, NY, 2008.

References:

1. Ross PJ, Taguchi Techniques for Quality Engineering, McGraw-Hill Book Company, NY, 2008.

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16ME3207-Automobile Engineering

(Professional Elective-I)

III Year B.Tech, ME - II Semester

L	T	P/D	C
3	-	-/-	3

Pre-requisites: Thermodynamics and Thermal Engineering-I

Course Objectives:

1. Introduction To Engineering analysis of the automobiles and its sub systems.
2. Applications of engineering principles to automotive design.
3. Improves ability to understand the different types of engines and automobile bodies.
4. Familiarization with the automotive industry and its terminology.
5. Develops an idea of utilization of resources duly reducing emission levels for achieving eco-friendly environment.

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

CO1	Understand the basic lay-out of an automobile.
CO2	Understand the operation of engine cooling, lubrication, ignition, electrical and air conditioning systems.
CO3	Understand the principles of transmission, suspension, steering and braking systems.
CO4	Understand automotive electronics. Study latest developments in automobiles.
CO5	Appraise the recent trends in alternate fuels and automobile safety system..

Detailed Syllabus:

UNIT-I: **Introduction :** Components of four wheeler automobile – chassis and body – power unit – power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, reboring, decarburization, Nitriding of crank shaft.

Emission from Automobiles – Pollution standards, National and international – Pollution Control – Techniques – Noise Pollution & control.

UNIT-II: Fuel System: S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pumps – carburetor – types – air filters – petrol injection.

C.I. Engines: Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, Alternative fuels for Automobiles-injection, Classification, Properties, Hybrid vehicles injection timing, testing of fuel, pumps.

UNIT-III: Cooling System : Cooling Requirements, Air Cooling, Liquid Cooling and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporating cooling – pressure sealed cooling – antifreeze solutions. Ignition System: Function of an ignition system, battery ignition system, constructional features of storage battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

UNIT-IV: Electrical System : Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

Transmission System: Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – Gear boxes, types, sliding mesh, construct mesh, synchro-mesh gear boxes, epicyclic-gear box, over drive torque converter.

Propeller shaft – Hoatch – Kiss drive, Torque tube drive universal joint, differential rear axles – types – wheels and tyres.

UNIT-V: Emissions from Automobiles: **Steering System :** Steering geometry – camber, castor, king pin rake, combined angle toe in, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

Suspension System: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

Braking System: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.

Text Books:

1. Kirpal Singh, Automobile Engineering ,Vol. 1, Standard Publishers, 13th Edition edition (2012)
2. Kirpal Singh, Automobile Engineering , Vol. 2, Standard Publishers-Distributors ,2011.
3. K.M Gupta, Automobile Engineering , Vol. 1 & Vol. 2 ,by Umesh publication, 2012.

References:

1. R K Rajput.,A Text Book of Automobile Engineering., Laxmi Publications. Second edition,2017.
2. S K Gupta.,A Text Book of Automobile Engineering., S. Chand Publications.2013
3. Newton Steeds & Garrett -Automotive Engineering, Butterworth-Heinemann, 2001.
4. Khalil U Siddiqui, A Text Book of Automobile Engineering By New Age International, **Aug, 2012.**
5. William H Crouse., Automobile Engineering., McGraw Hill-2012.

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16ME3208 – MATERIALS MANAGEMENT

(Professional Elective –I)

III Year B.Tech, ME - II Semester

L	T	P/D	C
3	-	-/-	3

Pre-requisites: None

Course Objectives:

1. Understand how material management should be considered for profitability
2. To provide students with analytical skills that are necessary for the understanding of inventory and warehousing management knowledge and principles.

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

CO1	Gain knowledge on effective utilization of materials in manufacturing and service organisation
CO2	Demonstrate the importance of optimum inventory and efficient warehousing management in business.
CO3	Evaluate quantitative and qualitative methods and software applications in purchasing management and strategic sourcing.
CO4	Demonstrate the importance of optimum inventory and efficient warehousing management in business.
CO5	Solve inventory and warehousing issues in an integrated logistics flow which reflects sound business practices.

Detailed Syllabus:

UNIT- I INTRODUCTION: Introduction to material management and productivity, functions of material management, organization structures in material management, role of material management techniques in improving material productivity, material coding.

UNIT-II MATERIAL PLANNING: Objectives, Bill of materials (BoM) material requirement planning [MRP-1], manufacturing resource planning [MRP-2], JIT, production planning, strategic material planning. Concepts of value analysis.

UNIT- III PURCHASE MANAGEMENT: Importance of good purchasing system, organization of purchasing functions, purchase policy and procedures, responsibility and limitations, purchase objectives, functions and organisation, market exploration and source selection, material purchase request, purchase enquiry, selection of appropriate purchase mode, modes of tendering- open tender, limited, proprietary, single, spot, global procurement, customer nominated source. purchase without tendering, rate contract, tender box, receipt of tender, opening of tenders, unsolicited tender, late tender, technical evaluation (Single Bid),Technical Evaluation Committee (Two Bid System),purchase proposal, Purchase order and order amendments. Goods inward inspection, Acceptance-sampling inspection.

UNIT IV STORES MANAGEMENT: Stores management and functions – responsibilities of store keeper, stores systems and procedures-incoming materials control-stores accounting of receipt vouchers and issue vouchers, issues pricing, physical stock verification – reconciliation of shortages and overages, analysis of non-moving, obsolete items and its disposal, follow up on shortages.

Cost reduction: cost control v/s cost reduction, price analysis, standard costing ,material cost reduction techniques, variety reduction, cost reduction and value improvement, techniques of cost control, cost effectiveness-performance measurement, cost analysis for material management.

UNIT-V Inventory management: inventory v/s stores, types of inventory, inventory control, inventory build –up, EOQ, various inventory models, inventory models with quantity discount, exchange curve concept, coverage analysis, optimal stocking and issuing policies, inventory management of perishable commodities, Selective inventory techniques, case studies.

Text Books:

1. J.R.Tony Arnold, Stephen N. Chapman, Lloyd M. Clive, Materials Management, Pearson, 2012.
2. P. Gopalakrishnan, Purchasing and Materials Management, Tata McGraw Hill, 2012
3.W.R.StelzerJr. Materials Management, *PHI* Private Limited,1979

References

1. A.K.Chitale and R.C.Gupta, Materials Management, Text and Cases, PHI Learning, 2nd Edition, 2006
2. A.K.Datla, Materials Management, Procedure, Text and Cases, PHI Learning, 2nd Edition, 2006
3. Ajay K Garg, Production and Operations Management, Tata McGraw Hill , 2012
4. Ronald H. Ballou and Samir K. Srivastava, Business Logistics and Supply Chain Management, Pearson Education,Fifth Edition, *Pearson Education*, 2007
5. S. N. Chary, Production and Operations Management, Tata McGraw Hill , 2012.
6. S. N. Chary, Production and Operations Management, Tata McGraw Hill , 2012.

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16ME3209 – TOOL DESIGN

(Professional Elective –I)

L	T	P/D	C
3	-	-/-	3

III Year B.Tech, ME - II Semester

Pre-requisites: Material Science, Design of Machine Elements, Production Technology

Course Objectives:

1. To develop the ability in the student to design cutting tools and press tools, jigs and fixtures for given condition
2. To impart the students the knowledge of multi directional properties of materials, failure criteria and fracture mechanics of materials.
3. Reduce the overall cost of manufacturing a product by producing acceptable parts at lowest cost.
4. Increase the production rate by designing tools that will produce parts as quickly as possible.

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

CO1	Identify material for cutting tools and gauges; classify various cutting tools and gauges and identify their nomenclature.
CO2	Describe tool design methods and punch and die manufacturing techniques.
CO3	Describe the principles of clamping, drill jigs and computer aided jig desig**n**
CO4	Design fixtures for milling, boring, lathe, grinding, welding; identify fixtures and cutting tools for NC machine tools
CO5	Explain the principles of dies and moulds design.

Detailed Syllabus:

UNIT –I: INTRODUCTION TO TOOL DESIGN: Tooling -requirements of a tool designer-general tool design Procedure.

Different tool materials: cemented carbides, coated carbides, cermets, ceramics and polycrystalline tool materials - compositions - properties of tool materials - Selection and treatment- Plastics as tooling materials - New tooling materials.

UNIT- II: CUTTING TOOL DESIGN: Design of single point turning and threading tools – Design of shank section and selection of tool geometry – Solid type tool-brazed tip tool-Selection of tool holders and inserts for turning - Chip breakers - Design of twist drill and reamers

UNIT –III: PRESS TOOL DESIGN: Press working terminology - Presses and press accessories - Computation of capacities and tonnage requirements - Strip layout - Types of dies - Design and development of various types of cutting, forming, bending and drawing dies - Progressive dies, Combination dies and compound dies - Blank development for cylindrical and non cylindrical shells.

UNIT – IV: DESIGN OF JIGS: Principles of jigs and fixtures - Location principles, Locating elements, Drill bushes, Different types of jigs - Plate, latch, channel, post, angle plate, turn over, and pot jigs - Automatic drill jigs, Design and development of jigs for given components.

UNIT- V: DESIGN OF FIXTURES: Design principles of fixtures - Design of fixtures for different machine tool operations. Design of fixture for assembly - inspection and welding. Design and development of fixtures for given components.

Case study in Jigs, fixture and press tools.

Text Books

1. Sadasivan.T.A, and Sarathy.D, "Cutting tools for Productive machining", 1st edition,Widia(India) Ltd, Bangalore, 1999.
2. Donaldson.C, Lecain.G.H and Goold.V.C, "Tool Design", Tata McGraw Hill publishing companylimited, New Delhi, 2002.
3. Edward G. Hoffman, "Jigs and Fixture design", 2nd edition, Galgotia publication Pvt. Ltd., New Delhi, 1987.

References

1. Hiram E. Grant, "Jigs and Fixtures - Non standard clamping device", Tata McGraw Hill, NewDelhi, 1971.
2. Prakash H. Joshi, "Press tool design and construction", 1st edition, Wheeler Publishing, NewDelhi, 2000.
3. Kempster.M.H.A, "An Introduction to Jig and tool design", 3rd edition, ELBS, 1987.
4. Prakash H. Joshi, "Cutting tools", 1st edition, Wheeler Publishing, New Delhi, 1997.
5. Prakash H. Joshi, "Tooling Data", 1st edition, Wheeler Publishing, New Delhi, 2000.

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16ME3210 - COMPUTATIONAL FLUID DYNAMICS

(Professional Elective –II)

L	T	P/D	C
3	-	-/-	3

III Year B.Tech, ME - II Semester

Pre-requisites: Fluid Mechanics
Course Objective:

1. To apply the principles of Heat Transfer and Fluid Mechanics to formulate governing equations for physical problems and to solve those using different numerical techniques

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

CO1	Develop mathematical models for flow phenomena.
CO2	Analyze mathematical and computational methods for fluid flow and heat transfer Simulations.
CO3	Solve computational problems related to fluid flows and heat transfer.
CO4	Evaluate flow parameters in internal and external flows.
CO5	Develop flow simulation code for fluid flow and heat transfer problems.

UNIT – I: Methods to solve a physical problem-Numerical Methods-Brief comparison between FDM, FEM and FVM-Applied Numerical Methods: Solution of a system of simultaneous Linear Algebraic Equations, iterative schemes of Matrix Inversion, Direct Methods for Matrix inversion, Direct Methods for banded matrices.

Finite Difference Applications in Heat conduction and Convention – Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer, closure.

UNIT – II: Finite Differences, discretization, consistency, stability, and Fundamentals of fluid flow modeling:

Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods

UNIT – III: Errors and stability analysis, introduction, first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme.

Review of Equations Governing Fluid Flow and Heat Transfer:

Introduction, conservation of mass Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier-stokes equations.

UNIT – IV: Steady flow, dimensionless form of Momentum and Energy equations, Stokes equation, and conservative body force fields, stream function- Vorticity formulation, Boundary-layer theory, Buoyancy – Driven Convection and stability.

UNIT – V: Simple CFD Techniques, viscous flows conservation form space marching, relovation techniques, viscous flows, conservation from space marching relovation techniques, artificial viscosity, the alternating direction implicit techniques, pressure correction technique, computer graphic techniques used in CFD.

Quasi one dimensional flow through a nozzle, turbulence models, standard and high Reynolds number models and their applications.

Text Books

1. Computational Fluid Flow and Heat Transfer/ Muralidharan & Sundarajanan/ Narosa Publications,
2. Numerical Methods –E.Balaguruswamy/TMH,

Reference Books:

1. Computational Fluid Dynamics basics with applications- John.D, Anderson / Mc graw hill.
2. Computational Methods for Fluid Dynamics –Firziger & peric/springer.
3. Numerical methods for Engineer – Chapra & Canale/TMH.

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16ME3211–Refrigeration and Air Conditioning

(Professional elective - II)

L	T	P/D	C
3	-	-/-	3

III Year B.Tech, ME - II Semester

Pre-requisites: Thermodynamics
Course Objectives: The course content enables students to:

1. Provide the basics of refrigeration cycles and performance calculations.
2. Provide the basics of air conditioning
3. Provide the knowledge on different refrigeration techniques
4. Provide the basic principles of psychrometry.
5. Develop knowledge on the different air conditioning systems and components.

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

CO1	Illustration of vapour compression and vapour absorption system operations and how it works.
CO2	Describe the analysis of sub cooled, super heat, sensible, latent heat and COP calculations, different types of refrigeration systems.
CO3	Choose various types of refrigerants and its applications, global warming, Ozone depletion potential
CO4	Identify different types of air properties (DBT, WBT, DPT, and Humidity) and predict relative cooling load calculations in Air conditioning system.
CO5	Design and understand the function of each of the major refrigeration system components: evaporator, compressor, condenser, and metering device

Detailed Syllabus:

UNIT-I: Introduction to Refrigeration: - Necessity and applications – Unit of refrigeration and C.O.P. – Mechanical Refrigeration – Types of Ideal cycle of refrigeration.

Air Refrigeration: Bell Coleman cycle and Brayton Cycle, Open and Dense air systems – Actual air refrigeration system – Refrigeration needs of Air craft's- Air systems – Actual Air refrigeration system – Refrigeration needs of Air craft's – Application of Air Refrigeration – Types of systems – Problems.

UNIT-II: **Vapour compression refrigeration** – working principle and essential components of the plant – Simple Vapour compression refrigeration cycle – COP – Representation of cycle on T-S and p-h charts – effect of sub cooling and super heating – cycle analysis – Actual cycle Influence of various parameters on system performance – Use of p-h charts –

Problems.

UNIT-III: System Components: Compressors – General classification – comparison – Advantages and Disadvantages. Condensers – classification – Working Principles Evaporators – classification – Working Principles - Expansion devices – Types – Working Principles

Refrigerants – Desirable properties – common refrigerants used – Nomenclature – Ozone Depletion – Global Warming – Azeotropes and Zeotropes.

UNIT-IV: Vapor Absorption System – Calculation of max COP – description and working of NH3 – water system – Li – Br system. Principle of operation Three Fluid absorption system, salient features.

Steam Jet Refrigeration System – Working Principle and Basic Components

Principle and operation of (i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube.

UNIT-V: Introduction to Air Conditioning:

Psychometric Properties & Processes – Sensible and latent heat loads – Characterization – Need for Ventilation, Consideration of Infiltration – Load concepts of RSHF, ASHF, ESHF and ADP.

Concept of human comfort and effective temperature –Comfort Air conditioning – Industrial air conditioning and Requirements – Air conditioning Load Calculations.

Air Conditioning systems - Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, deodorants, fans and blowers.

Heat Pump – Heat sources – different heat pump circuits – Applications.

Text Books:

1. SC Arora & Domkundwar / Dhanpatrai, A Course in Refrigeration and Air conditioning,2012.
2. Manohar Prasad, Refrigeration & Air- conditioning-New age international publications,2015.
3. CP Arora, Refrigeration and Air Conditioning /TMH,2008.

References:

1. W.Stoecker, Refrigeration & Air conditioning-Mc.Graw-Hill Higher education,1989.
2. Roy.J.Dossat ,Principles of Refrigeration - PEARSON publications,1989.
3. Barron ,Cryogenics -Oxford University Press 1980.
4. Klausd. Timmerhaus &Richard P.Reed,Cryogenic Engineering-Springer,2007.
5. Carrier, Hand Book of Air conditioning system design –McGRAW-Hill Book company,2009.
6. F.Stoecker & Jerold. W.Jones-MGH Intrl., 1982, Refrigeration & Air conditioning,1982.
7. Guide and data book- ASHRAE,2013.

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16ME3212– Additive Manufacturing

(Professional elective - II)

III Year B.Tech, ME - II Semester

L	T	P/D	C
3	-	-	3

Pre-requisites: Production technology-I, Production technology-II

Course Objectives:

1. Use commercial software for digitizing free-form geometry.
2. Create the design of an object suitable for additive manufacturing processes.
3. Compare traditional versus next generation manufacturing.
4. Define and apply criterion for selecting appropriate additive manufacturing process for any given application.
5. Investigate application domain of additive manufacturing.

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

CO1	Identify variety of Additive Manufacturing (AM) technologies
CO2	Evaluate their potential to support design and manufacturing
CO3	Capture digital data from a difficult to design object and make a manufactured model
CO4	Design the case studies relevant to mass customized manufacturing
CO5	Determine a suitable additive technique for bio-manufacturing

Detailed Syllabus:

UNIT -I : INTRODUCTION: Need - Development of Additive Manufacturing (AM) systems – AM process chain - Impact of AM on Product Development - Virtual Prototyping - Rapid Tooling – Rapid Prototyping (RP) to AM - Classification of AM processes, Benefits and Applications.

UNIT -II : REVERSE ENGINEERING AND CAD MODELING: Basic concepts - Digitization techniques – Model reconstruction – Data Processing for Rapid Prototyping: CAD model preparation, Data requirements.

Introduction to Geometric modeling techniques: Wire frame, surface and solid modeling – data formats - Data interfacing, Part orientation and support generation, Support structure design, Model Slicing, Tool path generation - Software for AM - Case studies.

UNIT -III : LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS: Stereo lithography Apparatus (SLA): Principle, pre-build process, part-building and post-build processes, photo polymerization of SL resins, part quality and process planning, Recoating issues, materials, advantages, limitations and applications. Solid Ground Curing (SGC): working principle, process, strengths, weaknesses and applications. Fused deposition Modeling (FDM): Principle, details of processes, process variables, types, products, materials and applications. Laminated Object Manufacturing (LOM): Working Principles, details of processes, products, materials, advantages, limitations and applications - Case studies.

UNIT- IV: POWDER BASED ADDITIVE MANUFACTURING SYSTEMS: Selective Laser Sintering (SLS): Principle, process, Indirect and direct SLS- powder structures, materials, post processing, surface deviation and accuracy, Applications. Laser Engineered Net Shaping (LENS): Processes, materials, products, advantages, limitations and applications– Case Studies.

UNIT- V : OTHER ADDITIVE MANUFACTURING SYSTEMS: Three dimensional Printing (3DP): Principle, basic process, Physics of 3DP, types of printing, process capabilities, material system. Solid based, Liquid based and powder based 3DP systems, strength and weakness, Applications and case studies. Shape Deposition Manufacturing (SDM), Ballistic Particle Manufacturing (BPM), Selective Laser Melting, Electron Beam Melting.

Text Books:

1. Gibson, I., Rosen, D.W. and Stucker, B., "Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.
2. Chua, C.K., Leong K.F. and Lim C.S., "Rapid prototyping: Principles and applications", second edition, World Scientific Publishers, 2010.

References:

1. Gebhardt, A., "Rapid prototyping", Hanser Gardener Publications, 2003.
2. Liou, L.W. and Liou, F.W., "Rapid Prototyping and Engineering applications : A tool box for prototype development", CRC Press, 2011.
3. Kamrani, A.K. and Nasr, E.A., "Rapid Prototyping: Theory and practice", Springer, 2006.
4. Hilton, P.D. and Jacobs, P.F., Rapid Tooling: Technologies and Industrial Applications, CRC press, 2005.

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16ME3213– COMPOSITE MATERIALS

(Professional Elective-II)

L	T	P/D	C
3	-	-	3

III Year B.Tech, ME - II Semester

Pre-requisites: Metallurgy and Material Science

Course Objectives:

1. To know the properties of fiber and matrix materials used in composites, as well as some common manufacturing techniques.
2. To know how to analyze a laminated plate in bending, including finding laminate properties from lamina properties.
3. To understand the strength of an orthotropic lamina and measurement of basic composite properties.

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

CO1	Understand all the concepts and properties of composite materials.
CO2	Analyze all the macro and micro mechanical behavior of composite lamina
CO3	Evaluate all the stresses and strain especially interlaminars
CO4	Compare all the failure theories along with fatigue and fracture.
CO5	Develop governing equations for bending, buckling and vibrations in laminated plates

Detailed Syllabus:

UNIT-I: INTRODUCTION: Fibres, Matrix materials, interfaces, polymer matrix composites, metal matrix composites, ceramic matrix composites, carbon fibre composites.

UNIT-II: MICROMECHANICS OF COMPOSITES: Mechanical properties: Production of Elastic constant, micromechanical approach, Halpin-Tsal equations, Transverse stresses. Thermal properties: Hygrothermal stresses, mechanics of load transfer from matrix to fibre.

UNIT-III: MACROMECHANICS OF COMPOSITES: Elastic constants of a lamina, relations between engineering constants and reduced stiffness and compliances, variation of

lamina properties with orientation, analysis of laminated composites, stresses and strains with orientation.

UNIT-IV: INTER-LAMINAR STRESSES AND EDGE EFFECTS. Simplified composite beam solutions. Bending of laminated beams. Tensile and compressive strength of unidirectional fibre composites, fracture modes in composites: Single and multiple fracture, de-bonding, fibre pullout and de-lamination failure, fatigue of laminate composite. Effect of variability of fibre strength.

UNIT-V: STRENGTH OF AN ORTHOTROPIC LAMINA: Maximum stress theory, maximum strain criteria, maximum work (Tsai-Hill) criterion, quadratic interaction criteria. Designing with composite materials. Measurement of constituent material properties: Fibre tests, Matrix tests. Measurement of basic composite properties: Tensile test, compressive test, a plane shear test, interlaminar shear test, flexure test.

Text Books

1. Jones, R.M., Mechanics of Composite Materials, Mc Graw Hill Co., 1967.
2. Ronald F. Gibson, Principles of Composite Material Mechanics, McGraw-Hill, Inc.

References

1. Madhujith Mukhopadyaya, Mechanics of Composite materials and Structures, University Press.
2. Calcote, L.R., The Analysis of Laminated Composite Structures, Van Nostrand, 1969.
3. Krishan, K. Chewla, "Composite Material", Springer - verlag, 1987
4. Autar K. Kaw, Mechanics of Composite Materials, Taylor and Francis group, London.
5. Carl. T. Herakovich, Mechanics of Fibrous Composites, John Wiley Sons Inc., 1998.
6. Whitney, I.M. Daniel, R.B. Pipes, Experimental Mechanics of Fibre Reinforced Composite Materials, Prentice Hall, 1984.
7. Hyer, M.W., Stress Analysis of Fibre Reinforced Composite Materials, Mc Graw Hill Co., 1998.

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16ME32L1 – Digital Fabrication and Instrumentation Lab

L	T	P/D	C
-	-	3/-	2

III Year B.Tech, ME, II Semester

Pre-requisites:

Students must known about the unconventional machining process subject and instrumentation and control system subject.

Course Objectives: Upon successful completion of this course students will be able to:

1. Explain the various types of software that can be used for digital fabrication.
2. Identify the best way to make a prototype when presented with a digital design.
3. Recognize the implications of mass manufacturing when designing a prototype.
4. Operate the machines to produce prototypes.
5. Discuss how digital fabrication is implemented in other fields.
6. Be able to measure common physical quantities using common sensors.
7. To analyze the temperature, pressure, vibrations, force, measuring techniques.

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

CO1	Understand the relationship between digital fabrication tools and computer software programs designed for developing three-dimensional forms, spaces and objects.
CO2	Develop a hands-on understanding of the multiple functions and processes of a fabrication lab.
CO3	Learn to measure, print and cut with precision as well as produce error free objects.
CO4	Learn to use advanced prototyping and manufacturing techniques in the production of art objects.
CO5	Recite the pressure measurement techniques
CO6	Solve the problems on measuring techniques of force, torque and speed.
CO7	Predict the measuring techniques of acceleration, Vibration and density.

DETAILED SYLLABUS

DIGITAL FABRICATON LAB:

1. Introduction to Basic 3D modeling techniques.
2. To perform free style modeling using 3D modeling software.
3. To understand and implement parametric design concepts.
4. To perform 3D Printing of the designed model.
5. To perform the 3D Scanning using laser scanners.
6. To understand and implement 3D Printing concepts for conversion of CAD model into real

Part: slicing, effect of part orientation.

Additional Experiments

1. Project involving ideation, design and final fabrication using 3D printing.

INSTRUMENTATION:

1. Calibration of pressure gauges.
2. Calibration of resistance temperature detector for temperature measurement
3. Calibration of thermocouple for temperature measurement
4. Calibration of transducer for temperature measurement (thermistor).
5. Study and calibration of LVDT transducer for displacement measurement
6. Calibration of capacitive transducer for angular displacement
7. Study and calibration of a rotometer for flow measurement
8. Study and calibration of photo and magnetic speed pickups for the measurement of speed.

Additional Experiments

1. Calibration of strain gauge for temperature measurement
2. Study and use of a seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
3. Study and calibration of McLeod gauge for low pressure.

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16ME32L2 – CAM/CAE Lab

(Soft Core Elective –I)

L	T	P/D	C
--	--	3/-	**2**

III Year B.Tech, ME - II Semester

Pre-requisites: Mechanics of Solids, Finite Element Methods.

Course Objectives:

1. To understand the concepts of FEM application in computer aided engineering.
2. To do applications of analysis in various loading conditions on various engineering structures or objects.
3. To study the features of CNC Machine Tool.
4. To expose students to modern control systems (Fanuc, Siemens etc.,)
5. To know the application of various CNC machines like CNC lathe, CNC Vertical Machining centre, CNC EDM and CNC wire-cut and studying of Rapid prototyping.

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

CO1	Understand the applications of FEM in CAE
CO2	Do the analysis of structures in static and dynamic loading conditions.
CO3	Understand the CNC control in modern manufacturing system.
CO4	Prepare CNC part programming and perform manufacturing.
CO5	Do the selecting and planning the process of manufacturing.

Detailed Syllabus:

Computer Aided Engineering (CAE):

1. Observe how to apply distributed loads and use element tables to extract data.
2. Observe the deflection caused by the weight of the beam itself.
3. Understand and perform the steps required to perform Harmonic analysis of the cantilever beam.
4. To solve a simple 2D Truss problem.
5. To perform a simple nonlinear analysis on a truss or beam.

6. To solve a simple steady state and transient conduction problem.
7. To outline and perform a simple coupled thermal/structural analysis.

Additional Experiments

1. To solve a buckling load.
2. Outline the steps required to create an axisymmetric model.

Computer Aided Manufacturing (CAM)

1. Development of computer numerical control part program for step turning and machining of a component.
2. Development of computer numerical control part program for taper turning and machining of a component.
3. Development of computer numerical control part program for slot milling and machining of a component.
4. Development of computer numerical control part program for profile milling and machining of a component.

Additional Experiments

1. Selecting and planning the process of manufacture.

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16ME32L3 - DESIGN FOR MANUFACTURING Lab

(Soft Core Elective–I)

L	T	P/D	C
--	--	3/-	**2**

III Year B.Tech, ME - II Semester

Pre-requisites: Auto-CAD

Course Objectives:

1. Use commercial software for digitizing free-form geometry.
2. Create the design of an object suitable for additive manufacturing processes.
3. Compare traditional versus next generation manufacturing.
4. Define and apply criterion for selecting appropriate additive manufacturing process for any given application.
5. Investigate application domain of additive manufacturing.

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

CO1	Apply principles relevant to mechanical design
CO2	Communicate a design and its analysis (written, oral, and graphical forms)
CO3	Analyze the alternate designs for the same application
CO4	Create useful solid models of simple elements and systems
CO5	Justify the implications of the alternate designs developed

List of Experiments:

1. Study and report on design principles for manufacturability
2. Study and report on influencing factors on Design
3. Design for Casting - develop alternate design for simple solid castings
4. Design for Casting - develop alternate design for hollow castings
5. Design for Casting - develop alternate design for complex shape castings
6. Design for welding - develop alternate design for simple structures
7. Design for welding - develop alternate design for complex structures
8. Design for Bulk deformation processes - develop alternate design for simple structural shapes
9. Design for Sheet metal working - develop alternate design for simple sheet metal shapes
10. Design for Powder metallurgical parts - develop alternate design for simple shapes produced by powder metallurgy

11. Design for Machining - develop alternate design for simple machined parts
12. Design for Machining - develop alternate design for hollow parts machining

Additional Experiments:

1. Design for Machining - develop alternate design for complex shapes requiring more number of operations
2. Design for Assembly - develop alternate design for simple assemblies

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16MB32P1- HUMAN VALUES AND PROFESSIONAL ETHICS

III Year. B. Tech. ME - II Semester

L	T	P/D	C
-	-	3/-	2

Pre-requisites: None

Course objectives:

Develop ability to

1. Help the students appreciate the essential complementarities between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. Facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Value based living in a natural way.
3. Highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.

Course Outcomes:

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

1. Ensure sustained happiness and prosperity
2. Appreciate values and skills and imply them in life situations
3. Develop a holistic approach towards life, profession and co-existence with others around
4. Emphasize the implications of ethical human conduct
5. Develop trust worthiness and interaction with nature enriching human behaviour

UNIT - I: Course Introduction - Need, basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self Exploration - what is it? - its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self exploration. Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities - the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly - A

critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT - II: Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

UNIT - III: Understanding Harmony in the Family and Society - Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; **Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.** Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astiva as comprehensive Human Goals. Visualizing a universal harmonious order in society - Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

UNIT - IV: Understanding Harmony in the nature and Existence - Whole existence as Co-existence: Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature - recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astiva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

UNIT - V: Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order,

b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,

c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order.

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b. At the level of society: as mutually enriching institutions and organizations.

Text Books:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

Reference Books:

1. Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
3. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986, 1991.
5. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.
6. A. N. Tripathy, 2003, Human Values, New Age International Publishers.
7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth - Club of Rome's report, Universe Books.
9. E G Seebauer & Robert L.Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
10. M Govindrajan, S Natrajan & V. S Senthil kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.