ACADEMIC REGULATIONS (R17)

COURSE STRUCTURE AND DETAILED SYLLABUS

(CHOICE BASED CREDIT SYSTEM (CBCS))

MECHANICAL ENGINEERING

For

B. Tech. - Regular Four Year Degree Course

(Applicable for the batches admitted from 2017 - 2018)

&

B. Tech. - Lateral Entry Scheme

(Applicable for the batches admitted from 2018 - 2019)

CMR INSTITUTE OF TECHNOLOGY

(UGC - Autonomous)

Approved by AICTE, Permanently Affiliated to JNTUH, Accredited by NAAC with A Grade and NBA

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FOREWORD

CMR Institute of Technology, established in the year 2005 has been bestowed with autonomous status by the UGC from the Academic Year 2017-18 for its remarkable academic accomplishments accompanied by its unflinching spirit and dedication to impart quality technical education to the deserving aspirants. The institution has commenced functioning independently within the set norms prescribed by UGC and AICTE. The performance of the institution manifests the confidence that the prestigious monitoring body, the UGC has on it, in terms of upholding its spirit and sustenance of the expected standards of functioning on its own consequently facilitating the award of degrees for its students. Thus, an autonomous institution is provided with the necessary freedom to have its own **curriculum, examination system and monitoring mechanism**, independent of the affiliating University but under its observance.

CMR Institute of Technology takes pride for having won the confidence of such distinguished academic bodies meant for monitoring the quality in technology education. Besides, the institution is delighted to sustain the same spirit of discharging the responsibilities that it has been conveying since a decade to attain the current academic excellence, if not improving upon the standards and ethics. Consequently, statutory bodies such as the Academic Council and the Boards of Studies have been constituted under the supervision of the Governing Body of the College and with the recommendations of the JNTU Hyderabad, to frame the regulations, course structure and syllabi for autonomous status.

The autonomous regulations, course structure and syllabi have been framed in accordance with the vision and mission of the institution along with certain valuable suggestions from professionals of various ancillary fields such as the academics, the industry and the research, all with a noble vision to impart quality technical education and contribute in catering full-fledged engineering graduates to the society.

All the faculty members, the parents and the students are requested to study all the rules and regulations carefully and approach the Principal to seek any clarifications, if needed, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the institution and for brightening the career prospects of engineering graduates.

PRINCIPAL

CMR INSTITUTE OF TECHNOLOGY

Vision: To create world class technocrats for societal needs.

Mission: Impart global quality technical education for a better future by providing appropriate learning environment through continuous improvement and customization.

Quality Policy: Strive for global excellence in academics & research to the satisfaction of students and stakeholders.

Department of Mechanical Engineering (ME)

Vision: To be a centre of excellence committed to provide quality education and research for nurturing technically competent and socially responsible mechanical engineering professionals

Mission: Provide state-of-art technical knowledge, research and consultancy in collaboration with industries and R&D organizations to meet the global and societal challenges in the field of mechanical engineering.

I. PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

PEO1: Graduate will have effective foundation in mathematics, science, engineering, technology, management, humanities and various other interdisciplinary subjects for successful career in mechanical engineering and related fields.

PEO2: Graduate will be able to pursue higher education and research and/or become an entrepreneur / innovator to design and develop mechanical systems to address technical, business and global challenges.

PEO3: Graduate exhibits professional ethics, communication skills, teamwork and adapts to changing environments of engineering and technology by engaging in lifelong learning.

II. PROGRAMME OUTCOMES (PO's)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms

of the engineering practice.

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
13. **PSO1:** Apply Geometric modeling, Analysis and Simulation tools to design and develop mechanical engineering systems.
14. **PSO2:** Apply advanced techniques in manufacturing, thermal engineering and automobile engineering to solve industry and societal problems.

B.Tech. - Regular Four Year Degree Program
(For batches admitted from the academic year 2017 - 18)
&
B.Tech. - Lateral Entry Scheme
(For batches admitted from the academic year 2018 - 19)

PREAMBLE

For pursuing four year under graduate Bachelor Degree Programme in Engineering (B.Tech.) offered by **CMR Institute of Technology** under Autonomous status will herein be referred to as CMRIT (Autonomous).

All the specified rules are herein approved by the Academic Council. These rules will be in force and are applicable to students admitted from the Academic Year 2017-18 onwards. Any reference to "Institute" or "College" in these rules and regulations stand for CMRIT (Autonomous).

All the rules and regulations specified shall hereafter be read as a whole for the purpose of interpretation, as and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, CMRIT (Autonomous) shall be The Chairman, Academic Council.

1. UNDER GRADUATE PROGRAMS OFFERED (E&T)

CMR Institute of Technology, an autonomous college affiliated to JNTUH, offers 4 Year (8 Semesters) **Bachelor of Technology** (B.Tech.) Degree Programme, under Choice Based Credit System (CBCS) with effect from the Academic Year 2017 - 18 onwards, in the following Branches of Engineering:

1) B.Tech.- Civil Engineering
2) B.Tech. - Mechanical Engineering
3) B.Tech. - Electronics and Communication Engineering
4) B.Tech. - Computer Science and Engineering

2. ADMISSION CRITERIA AND MEDIUM OF INSTRUCTION

2.1. Admission into first year of four year B.Tech. (Regular) Degree Programme:

2.1.1. **Eligibility:** A candidate seeking admission into the first year of four year B. Tech. Degree Programme should have:

(i) Passed either Intermediate Public Examination (IPE) conducted by the Board of Intermediate Education, Telangana, with Mathematics, Physics and Chemistry as optional subjects or any equivalent examination recognized by Board of Intermediate Education, Telangana or a Diploma in Engineering conducted by the Board of Technical Education, Telangana or equivalent Diploma recognized by Board of Technical Education for admission as per guidelines defined by the Regulatory bodies of Telangana State Council for Higher Education (TSCHE) and AICTE.

(ii) Secured a rank in the TSEAMCET examination conducted by TSCHE for allotment of a seat by the Convener, TSEAMCET.

2.1.2. **Admission Procedure:** Admissions are made into the first year of four year B.Tech. Degree Programme as per the stipulations of the TSCHE.

(a) Category A: 70% of the seats are filled through TSEAMCET counseling.
(b) Category B: 30% of the seats are filled by the Management.

2.2. Admission into the second year of four year B. Tech. (Regular) Degree Programme Under Lateral Entry Scheme.

2.2.1 Eligibility: A candidate seeking admission under Lateral Entry Scheme (LES) into the II year I Semester B. Tech. Regular Degree Programme should have passed the qualifying examination (B.Sc. Mathematics or Diploma in concerned course) and have secured a rank at Engineering Common Entrance Test TSECET (FDH). Admissions are made in accordance with the instructions received from the Convener, TSECET and Government of Telangana State.

2.2.2 Admission Procedure: Admissions are made into the II year of four year B.Tech. (Regular) Degree Programme through Convenor, TSECET (FDH) against the sanctioned intake in each Programme of study as lateral entry student.

2.3. Branch Transfers: There shall be no Branch transfers after the completion of Admission Process.

2.4. Medium of Instruction: The Medium of Instruction and Examinations for the entire B.Tech. programme will be in **English** only.

3. B.Tech. PROGRAMME STRUCTURE

3.1 Admitted under Four year B. Tech. (Regular) degree Programme:

3.1.1 A student after securing admission shall pursue the under graduate programme in B.Tech. in a minimum period of **four** academic years (8 semesters), and a maximum period of **eight** academic years (16 semesters) starting from the date of commencement of first year first semester, failing which, students shall forfeit their seat in B.Tech course.

3.1.2 Each semester is structured to provide 24 credits, totaling to 192 credits for the entire B.Tech. programme.

3.1.3 Each student shall secure 192 credits (with CGPA ≥ 5) required for the completion of the under graduate programme and award of the B.Tech. degree.

3.2 Admitted under Lateral Entry Scheme (LES) into B. Tech. degree Programme:

3.2.1 The LES students after securing admission shall pursue a course of study for not less than three academic years (6 Semesters) and not more than six academic years (12 Semesters), failing which students shall forfeit their seat in B.Tech programme.

3.2.2 The student shall register for 144 credits and secure 144 credits with CGPA ≥ 5 from II year to IV year B.Tech. programme (LES) for the award of B.Tech. degree.

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

3.3.1 Semester Scheme:

Each B.Tech. (Regular) Programme is of 4 Academic Years (8 Semesters) and B.Tech. (LES) Programme is of 3 Academic Years (6 Semesters)), with the academic year being divided into two semesters of 22 weeks (≥ 90 Instructional days per semester), each Semester having - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)', Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and Curriculum / Course Structure as suggested by AICTE.

3.3.2 Credit Courses:

a) All Subjects / Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Subject / Course in a L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods : Credits) Structure based on the following general pattern:

- One Credit - for One hour /Week / Semester for Theory /Lecture (L) Courses; and
- One Credit - for Two hours / Week / Semester for Laboratory / Practical (P) Courses

All Mandatory Courses, Study Tour, Guest Lecture, Tutorials, etc., will not carry any Credits.

b) **Contact Hours:** Weekly contact hours - equal to 33 hours per week (i.e. 1 hour = 60 Minutes) including credit and non-credit courses.

3.3.3 Subject / Course Classification and Nomenclature:

CMRIT has followed almost all the guidelines specified by AICTE / UGC / JNTUH for the classification of all subjects / courses offered at B.Tech. programme and are mentioned below.

S. No.	Broad Course Classification	Course Group / Category	Course Description	Range of Credits
1	Foundation Courses (FnC)	BS – Basic Sciences	Includes - Mathematics, Physics and Chemistry Subjects	15%-20%
2		ES – Engg. Sciences	Includes fundamental engineering subjects.	15%-20%
3		HS – Humanities and Social Sciences	Includes subjects related to Humanities, Social Sciences and Management.	5%-10%
4	Core Courses (CoC)	PC – Professional Core	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engg.	30%-40%
5	Elective Courses (EℓC)	PE – Professional Electives	Includes Elective subjects related to the Parent Discipline / Department / Branch of Engg.	10%-15%
6		OE – Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department / Branch of Engg.	5%-10%
7	Core Courses	Project Work	B.Tech. Project or UG Project or UG Major Project.	10%-15%
8		Industrial Training / Mini-Project	Industrial Training/ Internship/ UG Mini-Project/ Mini-Project.	
9		Technical Seminar	Seminar / Colloquium based on core contents related to Parent Discipline/ Department/ Branch of Engg.	
10	Minor Courses	Minor Courses	1 or 2 Credit Courses (subset of HS)	-
11	Mandatory Courses (MC)	Mandatory Courses (MC)	These courses are non-credit courses with evaluation.	-
12	Audit Courses (AC)	Audit Courses (AC)	These courses are non-credit courses without evaluation	-
Total Credits for UGP (B. Tech.) Programme				**192 (100%)**

4. COURSE REGISTRATION

4.1 A '**faculty advisor or counselor**' shall be assigned to each student, who advises the student about the B.Tech. programme, its course structure and curriculum, choice / option for subjects / courses, based on his/her competence, progress, pre-requisites and interest.

4.2 The academic section of the college invites 'registration forms' from students before the beginning of the semester through online submission, ensuring '**date** and **time stamping**'. The online registration requests for any 'current semester' shall be completed **before the commencement of SEEs (Semester End Examinations) of the 'preceding semester'**.

4.3 A student can apply for **online** registration, **only after** obtaining the '**written approval**' from his faculty advisor or counselor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with Head of the Department, faculty advisor and the student.

4.4 A student may be permitted to register for his/her subjects/course of **choice** with a total of 24 credits per semester (minimum of 20 credits and maximum of 28 credits, permitted deviation being± 17%), based on the student's **progress** and SGPA / CGPA, and completion of the '**pre-requisites'** as indicated for various subjects/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.

4.5 Choice for '**additional subjects / 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.

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

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

4.8 Dropping of subjects / courses may be permitted, only after obtaining prior approval from the faculty advisor / counselor (subject to retaining a minimum of 20 credits), '**within a period of 15 days**' from the commencement of that semester.

4.9 **Open electives**: Students have to choose one open elective wherever offered from the list of open electives given for their stream. However, student cannot opt for an open elective subject offered by their own (parent) department, if it is already listed under any category of the subjects offered by parent department in any semester.

4.10 **Professional electives**: Students have to choose professional elective wherever offered from the list of professional electives given. However, students may opt for professional elective subjects offered in the related area.

4.11 **Mandatory Courses (Non-Credit):** All mandatory courses where ever offered require prior registration.

4.11.1 NSS / Physical Education / Yoga Requirements:

i) The student has to enroll for NSS / Physical Education / Yoga programme from the date of commencement of class work for I year I semester.

ii) The NSS / Physical Education / Yoga programme schedule will be announced time to time by the respective coordinator(s).

iii) The Student has to submit the NSS / Physical Education / Yoga certificate on or before the last instruction day of I year I semester, otherwise his / her Semester End Examination results will not be declared.

4.11.2 Micro Project Requirements:

i) The student has to enroll for Micro-Project from the date of commencement of I Year II Semester class work in any topic of their choice, in consultation with the class coordinator / Counselor.

ii) The student has to collect relevant information on Science / Engineering & Technological advancements, prepare and present a report to the department evaluation committee for assessment.

4.11.3 Internship / Industrial Training / Certification Course / MOOCs :

i) Student has to Enroll for Internship / Industrial Training / Certification Course / MOOCs under the guidance and approval from the concerned faculty advisor / Counselor on or before the date of commencement of class work for II Year I Semester.

ii) Internship / Industrial Training / Certification Course / MOOCs completion certificate must be submitted to the Head of the Department on or before the last instruction day of III Year II Semester, otherwise his / her Semester End Examination results will be withheld.

5. SUBJECTS / COURSES TO BE OFFERED

5.1 A subject/course may be offered to the students, **if only** a minimum 1/3 of students register to the course.

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

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

6. ATTENDANCE REQUIREMENTS

6.1 A student shall be eligible to appear for the semester end examinations, if the student acquires a minimum 75% of attendance in aggregate (excluding the days of midterm examinations) for all the subjects / courses (excluding attendance in mandatory courses) in that semester.

6.2 Condoning of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be granted by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.

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

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

6.5 **Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled. They will not be promoted to the next semester.** They may seek re-registration for all those subjects registered in that semester in which student was detained, by seeking re-admission into that semester as and when offered; in case if there are any professional electives and / or open electives, the same may also be re-registered, if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the **same** set of elective subjects offered under that category.

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

7. ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in item no. 6.

7.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/course, if student secures not less than 35% marks in the semester end examination (SEE), and a minimum of 40% of marks in the sum total of the Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) taken together; in terms of letter grades, this implies securing **C** grade or above in that subject / course.

7.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to industry oriented mini-project and seminar, if student secures not less than 40% of the total marks in each of them. The student would be treated as failed, if student (i) does not submit a report on his industry oriented mini-project, or does not make a presentation of the same before the evaluation committee as per the schedule, or (ii) does not present the seminar as required in the IV year I/II semester, or (iii) secures less than 40% of marks in industry oriented mini-project / seminar evaluations. Student may reappear once for each of the above evaluations, when they are scheduled again; if he fails in such 'one re-appearance' evaluation also, student has to reappear for the same in the next subsequent semester, as and when it is scheduled.

7.3 Promotion Rules

7.3.1 Four year B.Tech. (Regular):

S. No.	Promotion	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.
2	First year second semester to second year first semester	**(i)** Regular course of study of first year second semester. **(ii)** Must have secured at least 24 credits out of 48 credits i.e., 50% credits upto first year second semester from all the relevant regular and supplementary examinations whether the student takes those examinations or not.
3	Second year first semester to second year second semester	Regular course of study of second year first semester.
4	Second year second semester to third year first semester	**(i)** Regular course of study of second year second semester. **(ii)** Must have secured at least 58 credits out of 96 credits i.e., 60% credits upto second year

		second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to third year second semester	Regular course of study of third year first semester.
6	Third year second semester to fourth year first semester	**(i)** Regular course of study of third year second semester. **(ii)** Must have secured at least 86 credits out of 144 credits i.e., 60% credits upto third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
7	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

7.3.2 Four year B.Tech. (LES):

S. No.	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	**(i)** Regular course of study of second year second semester. **(ii)** Must have secured at least 29 credits out of 48 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	**(i)** Regular course of study of third year second semester. **(ii)** Must have secured at least 58 credits out of 96 credits i.e., 60% credits upto third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

7.4 A student has to register for all subjects covering 192 credits (144 credits in case of LES) as specified and listed (with the relevant course / subject classifications as mentioned) in the course structure, fulfill all the attendance and academic requirements for 192 credits (144 credits in case of LES) securing a minimum of **'C'** grade or above in each subject, and 'earn all 192 credits (144 credits in case of LES) securing SGPA ≥ 5.0 (in each semester), and CGPA (at the end of each successive semester) ≥ 5.0, to successfully complete the under graduate programme.

7.5 After securing the necessary 192 credits (144 credits in case of LES) as specified for the successful completion of the entire under graduate programme, the student can avail exemption of two subjects up to 6 credits, that is, one open elective and one professional elective subject or two professional elective subjects for optional drop out from these 192 credits (144 credits in case of LES) earned; resulting in 186 credits (138 credits in case of LES) for under graduate programme performance evaluation, i.e., the performance of the student in these 186 credits (138 credits in case of LES) shall alone be taken into account for the calculation of 'the final CGPA (at the end of under graduate programme, which takes the SGPA of the IV year II semester into account)', and shall be indicated in the grade card of IV year II semester. However, the performance of student in the earlier individual semesters, with the corresponding SGPA and CGPA for which grade cards have already been given will not be altered.

7.6 If a student registers for some more '**extra subjects'** (in the parent department or other departments / branches of engineering) other than those listed subjects totaling to 192 credits (144 credits in case of LES) as specified in the course structure of parent department, the performances in those '**extra subjects**' (although evaluated and graded using the same procedure as that of the required 192 credits (144 credits in case of LES)) will not be taken into account while calculating the SGPA and CGPA. For such '**extra subjects'** registered, % of marks and letter grade alone will be indicated in the grade card as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations 6 and 7.1 to 7.5 above.

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

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

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

8. EVALUATION - DISTRIBUTION AND WEIGHTAGE OF MARKS

8.1 The performance of a student in each semester shall be evaluated subject-wise / course-wise (irrespective of credits assigned) with a maximum of 100 marks. These evaluations shall be based on 30 marks allotted for CIE (Continuous Internal Evaluation) and 70 marks for SEE (Semester End Examination), and a letter grade corresponding to the percentage of marks obtained shall be given.

8.2 Evaluation of Theory Subjects / Courses

A) Continuous Internal Evaluation: For each theory subject, during the semester, there shall be 2 mid-term examinations of 30 marks each. Each mid-term examination consists of subjective paper for 25 marks & assignment for 5 marks and the average of the two mid-term examinations marks shall be taken as the final marks.

I. 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.

II. The subjective paper shall be conducted for duration of 2 hours. Each subjective paper shall contain 2 parts (Part-A and Part-B). Part-A consists of one compulsory question with five sub questions carrying two marks each. Part-B consists of 3 essay questions carrying five marks each with internal choice; the student has to answer all 3 questions.

III. First assignment should be submitted before the commencement of the first mid-term examinations, and the second assignment should be submitted before the commencement of the second mid-term examinations. The assignments shall be specified / given by the concerned subject teacher.

IV. Absence in mid-term examination(s):

i) 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 on payment of prescribed fee.

ii) 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) on payment of prescribed fee.

B) Semester End Examinations: The duration of SEE is 3 hours. The details of the question paper pattern are as follows:

- The end semester examinations will be conducted for 70 marks consisting of two parts viz. i) **Part- A** for 20 marks, ii) **Part - B** for 50 marks.
- Part-A is compulsory question which consists of ten sub-questions (two from each unit) carry 2 marks each.
- Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. One question from each unit (may contain sub-questions) with internal choice.

8.3 Evaluation of Practical Subjects / Courses: In any semester, a student has to complete a minimum of 10 experiments / exercises in each laboratory course and get the record certified by the concerned Head of the Department to be eligible for Semester End Examination.

For practical subjects, there shall be a Continuous Internal Evaluation (CIE) during the Semester for 30 internal marks and 70 marks for Semester End Examination (SEE).

A) Continuous Internal Evaluation (CIE): Out of the 30 marks, 15 marks are allocated for day-to-day work evaluation and for the remaining 15 marks - two mid-term examinations of each 15 marks will be conducted by the concerned laboratory teacher for a duration of two hours and the average of the two mid-term examinations is taken into account.

I. Absence in Laboratory Internal Examinations:

a. 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.

b. 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.

B) Semester End Examination (SEE): The SEE for practical subject / course shall be conducted at the end of the semester with duration of 3 hours by one internal and one external examiner appointed by the Head of the Institution as per the recommendation of the concerned Head of the Department.

8.4 **Evaluation of Design / Drawing Subjects / Courses:** For the subjects such as Engineering Graphics, Machine Drawing and estimation, the distribution shall be 30 marks for CIE (15 marks for day-to-day work and 15 marks for internal examination) and 70 marks for SEE. There shall be two internal examinations in a semester and the average of the two shall be considered for the award of marks for internal examinations.

8.5 **Evaluation of Industry-Oriented Mini-Project:** There shall be an industry-oriented mini-project, in collaboration with an industry of their specialization, to be registered immediately after III year II semester examinations, and taken up during the summer vacation for four weeks duration. The industry oriented mini-project shall be submitted in a report form and presented before the committee in IV year I semester. It shall be evaluated for 100 marks by the committee consisting of Head of the Department, concerned supervisor and two senior faculty members of the department. There shall be no internal marks for industry-oriented mini- project.

8.6 **Evaluation of Technical Seminar:** The student has to enroll and get approval for technical seminar on a specialized topic from the concerned advisor / counselor in the beginning of IV year II semester. The student should collect the information on a specialized topic, prepare a technical report, give seminar presentation on the topic and submit it to the department as notified by the concerned Head of the Department. It shall be evaluated by the departmental committee consisting of Head of the Department, seminar supervisor and two senior faculty members. The seminar report and the seminar presentation shall be evaluated for 100 marks. There shall be no semester end examination for the seminar.

8.7 **Evaluation of Major Project:** Student shall enroll for the project work during the IV year I semester, as per the instructions of the project guide / supervisor assigned by the Head of Department. Out of total 100 marks allotted for the project work 30 marks shall be for continuous internal evaluation and 70 marks for the end semester viva-voce examination. 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 senior faculty members, based on the work carried out and the presentation made by the student during internal reviews (at least two internal reviews shall be conducted). The project viva-voce shall be conducted by a committee comprising an external examiner, Head of the Department and Project Supervisor.

8.8 **Evaluation of Mandatory Non-Credit Courses:** For Mandatory non credit courses '**Satisfactory'** or "**Unsatisfactory'** shall be indicated instead of marks or letter grade and this will not be counted for the computation of SGPA / CGPA.

(i) For mandatory non-credit theory or practical courses such as Environmental Science & Technology, Gender Sensitization Lab, Human Values & Professional Ethics, Verbal Ability, Analytical Skills, Soft Skills, Quantitative Aptitude, the student has to secure ≥ 65% attendance and not less than 40 marks out of 100 marks in the CIE, then the student is declared as **pass** and will be qualified for the award of the degree.

(ii) For mandatory non-credit courses such as NSS / Physical Education / Yoga, Micro Project, Internship / Industrial Training / Certification Course / MOOCs, the student has to submit **satisfactory participation certificate** from the concerned authority.

9. GRADING PROCEDURE

9.1 Marks will be awarded to indicate the performance of each student in each theory subject, lab/practical's, design/drawing practice, technical seminar, industry oriented mini-project and major project. Based on the percentage of marks obtained in Continuous Internal Evaluation plus Semester End Examination, both taken together, as specified in item 8 above, a corresponding letter grade shall be given.

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

% of Marks Secured (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
90% and above (≥ 90% , ≤ 100%)	O (Outstanding)	10
Below 90% but not less than 80% (≥ 80% , < 90%)	A^+ (Excellent)	9
Below 80% but not less than 70% (≥ 70% , < 80%)	A (Very Good)	8
Below 70% but not less than 60% (≥ 60% , < 70%)	B^+ (Good)	7
Below 60% but not less than 50% (≥ 50% , < 60%)	B (above Average)	6
Below 50% but not less than 40% (≥ 40% , < 50%)	C (Average)	5
Below 40% (< 40%)	F (Fail)	0
Absent	Ab	0

9.3 A student obtaining '**F**' grade in any subject shall be considered **'failed**' and will be required to reappear as '**supplementary student**' in the end semester examination (SEE), as and when offered. In such cases, his internal marks (CIE marks) in those subject(s) will remain same as those he obtained earlier.

9.4 A letter grade does not imply any specific % of marks.

9.5 In general, a student shall not be permitted to repeat any subject/course (s) only for the sake of '**grade improvement**' or 'SGPA/CGPA improvement'. However, he has to repeat all the subjects/courses pertaining to that semester if he is detained.

9.6 A student earns grade point (GP) in each subject/course, on the basis of the letter grade obtained by him in that subject/course (excluding mandatory non-credit courses). Then the corresponding '**credit points**' (CP) are computed by multiplying the grade point with credits for that particular subject/course.

Credit Points (CP) = Grade Point (GP) x Credits

9.7 The student passes the subject/course only when he gets GP ≥ 5 (C grade or above).

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

$$\mathbf{SGPA\ (S_i) = \sum (C_i\ X\ G_i) / \sum C_i}$$

Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

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

$$\mathbf{CGPA = \sum (C_i\ X\ S_i) / \sum C_i}$$

where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

Illustration of calculation of SGPA					Illustration of calculation of CGPA			
Course /Subject	Credits	Letter Grade	Grade Points	Credit Points	Semester	Credits	SGPA	Credits x SGPA
Course 1	4	A	8	4 x 8 = 32	Sem I	24	7	24 x 7= 168
Course 2	4	O	10	4 x 10 = 40	Sem II	24	6	24 x 6= 144
Course 3	4	C	5	4 x 5 = 20	Sem III	24	6.5	24 x 6.5 =156
Course 4	3	B	6	3 x 6 = 18	Sem IV	24	6	24 x 6 = 144
Course 5	3	A^+	9	3 x 9 = 27	Sem V	24	7.5	24 x 7.5 =180
Course 6	3	C	5	3 x 5 = 15	Sem VI	24	8	24 x 8 = 192
Total	**21**			**152**	Sem VII	24	8.5	24 x 8.5 =204
SGPA = 152/21 = 7.23					Sem VIII	24	8	24 x 8 = 192
					Total	**192**		**1380**
					CGPA = 1380/192 = 7.18			

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

9.11 For calculations listed in Item 9.6–9.10, performance in failed subjects/courses (securing **F** grade) will also be taken into account, and the credits of such subjects/courses will also be included in the multiplications and summations. However, mandatory courses will not be taken into consideration.

10 PASSING STANDARDS

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

10.2 A Student shall be declared '**successful**' or '**passed**' in any non-credit subject/ course, if he secures a '**Satisfactory Participation Certificate**' for that mandatory course.

10.3 After the completion of each semester, a grade card or grade sheet (or transcript) shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. it will show the details of the courses registered (course code, title, no. of credits, 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 9.6– 9.9.

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

Percentage of Marks = (final CGPA – 0.5) x 10

12 AWARD OF DEGREE

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

Class Awarded	Grade to be Secured	Remarks
First Class with Distinction	≥ 8 CGPA	**From the aggregate marks secured from 192 Credits for Regular Students and 144 Credits for Lateral Entry Students.**
First Class	≥ 6.5 to < 8 CGPA	
Second Class	≥ 5.5 to < 6.5 CGPA	
Pass Class	≥ 5.00 to < 5.5 CGPA	
FAIL	CGPA < 5	

12.2 First class with distinction will be awarded to those students who clear all the subjects in single attempt during his / her regular course of study by fulfilling the following conditions:

(i) Should have passed all the subjects/courses in '**first appearance'** within the first 4 academic years (or 8 sequential semesters) for B.Tech. (Regular) and first 3 academic years (or 6 sequential semesters) for B.Tech. (LES) from the date of commencement of first year first semester for B.Tech. (Regular) and II year I semester for B.Tech. (LES).

(ii) Should have secured a CGPA ≥ 8.00, at the end of each of the 8 sequential semesters (6 sequential semesters for LES), starting from I year I semester (starting from II year I semester for LES) onwards.

(iii) Should not have been detained or prevented from writing the end semester examinations in any semester due to shortage of attendance or any other reason, shall be placed in '**first class with distinction'**.

12.3 **Award of Medals:** Students fulfilling the conditions listed under item 12.2 alone will be eligible for award of '**College Ranks**' and '**Medals**'.

12.4 **Graduation Day:** The College shall have its own Annual Graduation Day for the award of Degrees issued by the University.

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

13 WITH HOLDING OF RESULTS

If the student has not paid the fee to college at any stage, or has dues pending against his/her name due to any reason what so ever, or if any case of indiscipline is pending against him/her, the result of the student may be withheld, and he/she will not be allowed to go into the next higher semester.

14 SUPPLEMENTARY EXAMINATIONS

Supplementary examinations for odd semester subjects will be conducted along with even semester regular examinations and vice versa.

15. TRANSITORY REGULATIONS

A. For students detained due to shortage of attendance:

1. A Student who has been detained in I year of R09/R13/R15/R16 Regulations due to lack of attendance, shall be permitted to join I year I semester of R17 Regulations and he is required to complete the study of B.Tech. programme within the stipulated period of eight academic years from the date of first admission in I Year.

2. A student, who has been detained in any semester of II, III and IV years of R09/R13/R15/R16 regulations for want of attendance, shall be permitted to join the corresponding semester of R17 regulations and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year. The R17 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester.

   See rule (C) for further Transitory Regulations.

B. For students detained due to shortage of credits:

3. A student of R09/R13/R15/R16 Regulations, who has been detained due to lack of credits, shall be promoted to the next semester of R17 Regulations only after acquiring the required credits as per the corresponding regulations of his/her first admission. 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 R17 Academic Regulations are applicable to a student from the year of readmission onwards.

   See rule (C) for further Transitory Regulations.

C. For readmitted students in R17 Regulations:

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

5. The maximum credits that a student acquires for the award of degree, shall be the sum of the total number of credits secured in all the regulations of his/her study including R17 Regulations. The performance evaluation of the student will be done after the exemption of two subjects if total credits acquired are ≤ 206, three subjects if total credits acquired are > 206 (see R16 Regulations for exemption details).

6. If a student readmitted to R17 Regulations, has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R17 Regulations will be substituted by another subject to be suggested by the CMRIT Academic Council.

Note: If a student readmitted to R17 Regulations, has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in R17 Regulations, the Principal shall conduct remedial classes to cover those subjects/topics for the benefit of the students.

D. Promotion Rule: Where the credits allotted to a semester/year under the regulations studied in are different from that under R17 regulations for the corresponding semester/year, the promotion rules of R17 vide section 7.3 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 R17 regulations and revising the secured credits also in the same proportion.

16 STUDENT TRANSFERS

There shall be no transfers from other colleges / streams.

17 RULES OF DISCIPLINE

17.1 Any attempt by any student to influence the teachers, examiners, faculty members and staff of Controller of Examination office for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice case and the student can be debarred from the college.

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

17.3 When the student's answer book is confiscated for any kind of attempted or suspected malpractice the decision of the Malpractice Prevention Committee is final.

18. MALPRACTICE

18.1 **Malpractice Prevention Committee:** The committee shall examine the student's malpractice and indiscipline cases occurred, while conducting the examinations and recommend appropriate punishment to the Academic Council after taking explanation from the student and concerned invigilator as per the malpractice rules mentioned below. The committee consists of

a) Controller of Examinations - Chairman
b) Addl. Controller of Examinations.- Convener
c) Subject Expert - Member
d) Head of the Department of which the student belongs to - Member
e) The Invigilator concerned - Member

18.2 **Malpractice Rules:** Disciplinary Action for Improper Conduct in Examinations

S. No.	Nature of Malpractices / Improper Conduct	Punishment
1(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which 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 subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject 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 subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Principal.
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 subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The 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 imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the 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 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 subject.
6	Refuses to obey the orders of the Addl. Controller of examinations / 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 addl. Controller of examinations 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 addl. Controller of examinations, 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 subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
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 subject and all the other subjects 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 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.
8	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the 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.
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 subject and all other subjects 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 will be handed over to police and, a police case will be registered against them.
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects 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.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the principal for further action to award suitable punishment.	

19. SCOPE

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

ii) The above mentioned rules and regulations are applicable in general to both B.Tech. (Regular) and B.Tech. (LES), unless and otherwise specific.

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

20. REVISION AND AMENDMENTS TO REGULATIONS

The Academic Council may revise or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the dates notified by the Academic Council.

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COURSE STRUCTURE

B.Tech. – R-17 COURSE STRUCTURE

(Applicable from the batch admitted during 2017-18 and onwards)

I – B.Tech. – I - Semester							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	17ME1101BS	Engineering Mathematics – I	1,2,12	4	1	-	4
2	17ME1102BS	Engineering Physics	1,2,12	4	1	-	4
3	17ME1103BS	Engineering Chemistry	1,2,12	4	1	-	4
4	17ME1104ES	Engineering Mechanics	1,2,12	3	-	-	3
5	17ME1105ES	Computer Programming	1,2,3,12	3	1	-	3
6	17ME1106BS	Engineering Physics / Engineering Chemistry Lab	4	-	-	3	2
7	17ME1107ES	Computer Programming in C Lab	4	-	-	3	2
8	17ME1108ES	IT & Engineering Workshop	1,5,9,10	-	-	3	2
TOTAL				**18**	**4**	**9**	**24**
Mandatory Course (Non-Credit)							
9	17AC1109MC	NSS / Physical Education /Yoga	3,6,8,9,12	-	-	2	-

I – B.Tech. – II - Semester							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	17ME1201BS	Engineering Mathematics – II	1,2,12	4	1	-	4
2	17ME1202HS	Professional Communication in English	10,12	3	-	-	3
3	17ME1203ES	Basic Electrical & Electronics Engineering	1,2,3,12	4	1	-	4
4	17ME1204ES	Engineering Graphics	1,5,10	2	-	3	4
5	17ME1205ES	Data Structures through C	1,2,3,12	3	1	-	3
6	17ME1206HS	English Language Communication Skills Lab	5,10	-	-	3	2
7	17ME1207ES	Data Structures through C Lab	4	-	-	3	2
8	17ME1208ES	Basic Electrical & Electronics Engineering Lab	4	-	-	3	2
TOTAL				**16**	**3**	**12**	**24**
Mandatory Course (Non-Credit)							
9	17AC1209MC	Micro Project	1 to 14	-	-	2	-

II – B.Tech. – I – Semester							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	17ME2101BS	Statistical & Numerical Methods	1,2,12	4	1	-	4
2	17ME2102ES	Metallurgy & Material Science	1,2,12	3	-	-	3
3	17ME2103PC	Mechanics of Solids	1,2,3,12,13	3	1	-	3
4	17ME2104BS	Basic Thermodynamics	1,2,12,14	4	-	-	4
5	17ME2105PC	Kinematics of Machinery	1,2,3,12	4	-	-	4
6	17ME2106ES	Metallurgy & Material Science Lab	3,4,5	-	-	3	2
7	17ME2107BS	Fuels and Lubricants Lab	3,4,5	-	-	3	2
8	17ME2108PC	Mechanics of Solids Lab	3,4,13	-	-	3	2
TOTAL				**18**	**2**	**9**	**24**
Mandatory Course (Non-Credit)							
9	17HS2209MC	Environmental Science and Technology	1,6,7,12	3	-	-	-
10	17BS2210MC	Analytical Skills	9,10	-	-	2	-

II – B.Tech. – II – Semester							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	17ME2201PC	Manufacturing Processes	1,2,12,14	4	-	-	4
2	17ME2202PC	Dynamics of Machinery	1,2,3,12	4	-	-	4
3	17ME2203PC	Fluid Mechanics & Hydraulic Machines	1,2,3,12	4	-	-	4
4	17ME2204PC	Machine Drawing	4,5,6,10,13,14	1	-	3	3
5	17ME2205HS	Financial Analysis, Management & Economics	11,12	3	-	-	3
6	17ME2206PC	Manufacturing Processes Lab	3,4,14	-	-	3	2
7	17ME2207PC	Kinematics & Dynamics Lab	3,4,13	-	-	3	2
8	17ME2208PC	Fluid Mechanics & Hydraulic Machinery Lab	3,4,14	-	-	3	2
TOTAL				**16**	**-**	**12**	**24**
Mandatory Course (Non-Credit)							
9	17HS2109MC	Gender Sensitization Lab	9,12	-	-	2	-
10	17HS2110MC	Verbal Ability	9,10	-	-	2	

Note: 1. Enrollment of Internship / Industrial training / Certification course / MOOCs initiation from II-B.Tech.-I-Semester

III – B.Tech. – I - Semester							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	17ME3101PC	Thermal Engineering – I	2,3,12,14	4	-	-	4
2	17ME3102PC	Design of Machine Members – I	2,3,8,12,13	3	1	-	3
3	17ME3103PC	Refrigeration & Airconditioning	2,3,7,12,14	4	-	-	4
4	17ME3104PC	Machine Tools & Metrology	1,2,3,12,14	4	-	-	4
5	**Open Elective – I**			3	-	3	-
	17CE3105OE	Disaster Management	2,7,8,12				
	17ME3105OE	Operations Research	1,2,12				
	17EC3105OE	Electronic Measurements and Instrumentation	1,2,12				
	17CS3105OE	JAVA Programming	1,2,3,5,12				
6	17ME3106PC	Thermal Engineering Lab	3,4,7,14	-	-	3	2
7	17ME3107PC	Machine Tools Lab	3,4,6,14	-	-	3	2
8	17ME3108HS	Advanced English Communication Skills Lab	5,10	-	-	3	2
TOTAL				**18**	**1**	**9**	**24**
Mandatory Course (Non-Credit)							
9	17HS3109MC	Human Values & Professional Ethics	6,7,8,12	3	-	-	-
10	17BS3110MC	Quantitative Aptitude	9,10	3	-	-	-

III – B.Tech. – II – Semester							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	17ME3201PC	Thermal Engineering – II	2,6,12,14	4	-	-	4
2	17ME3202PC	Heat Transfer	1,2,3,12,14	4	1	-	4
3	17ME3203PC	Design of Machine Members – II	2,3,8,12,13	4	1	-	4
4	**Open Elective – II**			3	-	-	3
	17CE3204OE	Global Warming & Climate Change	2,6,7,8,12				
	17ME3204OE	Fundamentals of Robotics	1,2,5,12				
	17EC3204OE	Principles of Communication Systems	1,2,3,12				
	17CS3204OE	Database Management Systems	1,2,3,5,12				
5	**Professional Elective – I**			3	-	-	3
	17ME3205PE	Automobile Engineering	6,7,12,14				
	17ME3206PE	Nano Technology	2,5,6,7,12,13				
	17ME3207PE	Automation in Manufacturing	2,3,5,12,13,14				
	17ME3208PE	Mechanics of Composite Materials	2,3,4,12,13				
6	17ME3209PC	Heat Transfer Lab	4,6,7,14	-	-	3	2
7	17ME3210PC	Production Drawing Practice	4,5,6,10,13,14	-	-	3	2
8	17ME3211PC	Metrology Lab	3,4,6,14	-	-	3	2
TOTAL				**18**	**2**	**9**	**24**
Mandatory Course (Non-Credit)							
9	17HS3110MC	Soft Skills	9,10	-	-	2	-
10	17AC3213MC	Internship / Industrial training / Certification Course / MOOCs Certificate	1 to 14				

Note: 1. Industry Oriented Mini Project Carried out during summer vacation between III - B.Tech. – II – Sem. & IV- B.Tech. – I Sem. and evaluated in IV-B.Tech.-I-Semester

2. Internship / Industrial training / Certification course / MOOCs certificate submission on or before last instruction day of III-B.Tech.-II semester

IV – B.Tech. – I - Semester							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	17ME4101PC	CAD/ CAM	2,3,12,13	4	1	-	4
2	17ME4102PC	Instrumentation & Control Systems	1,2,12	4	1	-	4
3	17ME4103PC	Finite Element Methods	2,3,4,12,13	4	1	-	4
4	**Open Elective – III**			3	-	-	3
	17CE4104OE	Environmental Impact Assessment	6,7,10,12				
	17ME4104OE	Principles of Entrepreneurship	7,8,9,11,12				
	17EC4104OE	Principles of Embedded Systems	1,2,3,12				
	17CS4104OE	Web Technologies	2,3,5,6,12				
5	**Professional Elective – II**			3	-	-	3
	17ME4105PE	Operations Research	1,2,3,12,14				
	17ME4106PE	Power Plant Engineering	2,3,6,12,14				
	17ME4107PE	Industrial Engineering	1,2,8,11,12				
	17ME4108PE	Unconventional Machining Processes	2,3,5,12,14				
6	17ME4109PC	CAD/CAM Lab	4,5,10,13,14	-	-	3	2
7	17ME4110PC	Instrumentation & Control Systems Lab	3,4,5	-	-	3	2
8	17ME4111CC	Industry Oriented Mini Project	1 to 14	-	-	-	2
TOTAL				**17**	**3**	**6**	**24**
Mandatory Course (Non-Credit)							
9	17HS4112MC	Foreign Language: French	9,10	2	-	-	-
	17HS4113MC	Foreign Language: German					

IV – B.Tech. – II - Semester							
S. No.	Subject Code	Subject	POs	Hours Per Week			Credits
				L	T	P	
1	17ME4201PC	Robotics	1,2,12,14	4	1	-	4
2	**Professional Elective – III**			3	-	-	3
	17ME4202PE	Renewable Energy Systems	2,6,7,12,14				
	17ME4203PE	Machine Tool Design	2,3,4,5,12,13,14				
	17ME4204PE	Neural networks & Fuzzy logics	2,3,4,5,12,13,14				
	17ME4205PE	Production Planning and Control	2,3,11,12,14				
3	**Professional Elective - IV**			3	-	-	3
	17ME4206PE	Fluid Power Systems	2,3,4,12,13				
	17ME4207PE	Computational Fluid Dynamics	2,3,5,12,13				
	17ME4208PE	Flexible Manufacturing Systems	2,3,12,14				
	17ME4209PE	Advanced mechanics of solids	2,3,5,12,13				
4	17ME4210CC	Technical Seminar	1 to 14	-	-	3	2
5	17ME4211CC	Major Project	1 to 14	-	-	18	12
TOTAL				**10**	**01**	**21**	**24**

I-B.TECH.-I-SEMESTER SYLLABUS

ENGINEERING MATHEMATICS – I
(Differential Equations & Matrix Algebra)
(Common to all Branches)

I -B.Tech.-I-Sem **L T P C**
Subject Code: 17ME1101BS **4 1 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	solve linear and non-linear ordinary differential equations	3	2	1
CO2	solve system of linear equations by using matrices	3	2	1
CO3	find Eigen values and Eigen vectors	3	2	1
CO4	find the extreme values of functions of several variables and evaluation of improper integrals by using Beta and Gamma functions	3	2	1
CO5	evaluate multiple integrals and find the line, surface and volume integrals and convert them by using multiple integrals	3	2	1

UNIT - I

Differential Equations: Introduction, exact & Reducible to exact, Linear and Bernoulie's Differential Equations Applications to Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories, Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax}, Sin ax, cos ax, polynomials in x, $e^{ax}V(x)$, xV(x), method of Variation of parameters. Applications: Simple Harmonic Motion (SHM)

UNIT-II

Linear System of Equations: Types of real matrices and complex matrices, rank, Echelon form, normal form consistency and solution of linear systems (homogeneous and No- homogeneous) – Gauss Elimination, Gauss Jordon and LU decomposition methods-Applications: Finding current in the electrical circuits.

UNIT –III

Eigen values, Eigen vectors and Quadratic forms: Eigen values, Eigen vectors and their properties, Cayley – Hamilton theorem (without proof),Inverse and powers of a matrix using Cayley – Hamilton, Diagonalization, Quadratic forms, Reduction of Quadratic forms into their canonical form, rank and nature of the Quadratic forms – index and signature

Unit IV

Functions of Several Variables: Functions of several variables-Partial differentiation, Functional dependence, Jacobian, Maxima and Minima of functions of two variables with constraints and without constraints.

Beta and Gamma Functions: Beta and Gamma functions, properties, relation between Beta and Gamma functions, evaluation of integrals using Beta and Gamma functions.

Unit V

Multiple Integrals: Double and triple integrals, Change of variables, Change of order of integration. Applications: Finding areas, volumes& Center of gravity (evaluation using Beta and Gamma functions).

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, 42nd Ed., Khanna Publishers, New Delhi, 2012
2. E. Kreyszig,Advanced Engineering Mathematics, 9th Ed., Wiley, 2012
3. R. K. Jain, S. R. K. Iyengar,Advanced Engineering Mathematics, 4th Ed., Narosa Publishing House, NewDelhi,2014

Reference(s)

1. B. V. Ramana,Engineering Mathematics, 4th Ed., Tata McGraw Hill, New Delhi, 2009
2. D.S. Chandrashekharaiah, Engineering Mathematics, Volume 1, Prism Publishers, 2010
3. T.K.V.Iyengar, B. Krishna Ghandhi, S. Ranganathan and M.V. S.S.N. Prasad, Engineering Mathematics, Volume-I, 12th Ed.,S. Chand Publishers, 2014
4. U. M. Swamy, P. VijayaLaxmi, K. L. Sai Prasad and M. Phani Krishna Kishore, A Text Book of Engineering Mathematics–I, Excel Books, New Delhi, 2010

ENGINEERING PHYSICS

I-B.Tech.-I-Sem **L T P C**
Subject Code: 17ME1102BS **4 0 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	compare simple and damped harmonic oscillations	3	2	1
CO2	illustrate the interference and diffraction phenomena of light	3	2	1
CO3	examine the mechanism of various lasers and holography	3	2	1
CO4	demonstrate the propagation of light in optical fiber	3	2	1
CO5	analyze the properties of nanomaterials	3	2	1

Unit: I

1. Crystallography and Crystal Structures: Space Lattice, Unit Cell, Basis, Lattice parameters, Crystal Systems, Bravais Lattices, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Diamond Structure, Crystal Planes and Directions, Miller Indices, Inter Planar Spacing of Cubic Crystal Systems.

2. X-ray Diffraction: Basic Principles of **X**-ray Diffraction, Bragg's Law, Laue Method, Powder Method, Applications of X-ray Diffraction.

Unit: II

3. Acoustics of Buildings: Basic Requirement of Acoustically Good Hall, Reverberation and Time of Reverberation, Sabine's Formula for Reverberation Time (Qualitative), Measurement of Absorption Coefficient of a material. Factors affecting the Architectural acoustics and their remedies.

4. Ultrasonics: Introduction, production of ultrasonic waves, magnetostriction method, piezo electric method, detection of ultrasonic waves, properties of ultrasonic waves, use of ultrasonics for nondestructive testing, applications of ultrasonics.

Unit: III

5. Lasers: Characteristics of Lasers, Spontaneous and stimulated Emission of Radiation, Einstein's Coefficients, Population Inversion, Lasing Action, Ruby Laser, Helium- Neon Laser, Semiconductor Laser and Applications of Lasers.

6. Fiber Optics: Basic Principles & construction of an Optical Fiber, Acceptance Angle, Numerical Aperture, Types of Optical Fibers, Losses in Optical Fibers, Application of Optical fibers in communication system.

Unit IV

7. Dielectric Properties: Basic definitions: Electric dipole, Dipole moment, Permittivity, Dielectric constant, Polarizability, Electric susceptibility, Displacement vector; Electronic Polarization, Ionic Polarization and Orientation Polarization (Qualitative), Internal Fields in Solids, Clausius - Mossotti Equation ,Piezo electricity , Ferro electricity.

8. Magnetic Properties: Basic definitions , Origin of Magnetic moment, Bohr magneton, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Explanation of Hysteresis Curve on the basis of Domain Theory of Ferro magnetism.

Unit: V

9. Nanotechnology: Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-Gel, Top-Down Fabrication: Chemical Vapor Deposition, Characterization Techniques (SEM &TEM) and Applications of Nanotechnology.

Text books:

1. Engineering Physics by P K.Palanisamy, Scitech Publishers

2. Modern Engineering Physics by Dr.K.Vijay kumar, Dr.S.Chandralingam, S.Chand & Company LTD.
3. Applied Physics by P.K.Mittal, I K International Publishers.
4. Engineering Physics by Dr. M.Armugam , Anuradha Publication.
5. Applied Physics for Engineers by P. Madhusudana Rao, Academic Publishing Company.

References:

1. Principles of physics by Halliday, Resnick, Walker, Wiley India Pvt Ltd,9thEdition.
2. Introduction to solid state physics by Charles Kittel, Wiley India Pvt Ltd,7thEdition
3. Engineering Physics by R. K. GAUR & S.L.GUPTA, Dhanpat Rai Publications.
4. Solid State Physics by AJ Dekker, Macmillan INDIA LTD.

ENGINEERING CHEMISTRY

I-B.Tech.-I-Sem **L T P C**
Subject Code: 17ME1103BS **4 1 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	identify the properties of water and various treatment methods	3	2	1
CO2	apply the concepts of electrochemistry and corrosion control	3	2	1
CO3	make use of polymers in domestic and industrial fields	3	2	1
CO4	analyze the quality of fuels used in automobiles, industry and aerospace	3	2	1
CO5	illustrate the properties of various engineering materials	3	2	1

UNIT-I

Water and its treatment: Introduction – hardness of water – causes of hardness – types of hardness: temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Numerical problems. Boiler troubles: Sludges, scales and Caustic embrittlement. Internal treatment of Boiler feed water – Calgon conditioning – Phosphate conditioning – Colloidal conditioning – Softening of water by ion exchange processes. Potable water and its specification- Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and Ozonization Desalination of water – Reverse osmosis.Deflouridation-Nalgonda technique.

UNIT-II

Electrochemistry and Corrosion:

Electrochemistry: Introduction, conductance-specific,equivalent and molar conductance,Electrode-Types of electrodes – Construction and functioning of Standard hydrogen electrode calomel and glass electrode. Nernst equation – electrochemical series and its applications. Electrochemical cells: Daniel cell – cell notation, cell reaction and cell EMF – Numerical problems.

Batteries: Cell and battery – Primary battery (dry cell, alkaline and Lithium cell) and Secondary battery (lead acid, Ni-Cd and lithium ion cell),

Fuel cells: Hydrogen –oxygen and methanol-oxygen fuel cells – Applications.

Corrosion and its Prevention: introduction-theories of corrosion: dry corrosion-wet corrosion-types: galvanic corrosion-concentration cell corrosion-waterline and pitting corrosion-factors influencing rate of corrosion by environment-Corrosion control methods-cathodic protection-metallic coatings: galvanization and tinning.

UNIT-III

Polymers: Definition – Classification of polymers with examples – Types of polymerization – addition(free radical mechanism),Co-Polymerization and condensation polymerization with examples.

Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, compounding and fabrication of plastics (compression and injection moulding). Preparation, properties and engineering applications of PVC and Bakelite.

Fibers: Characteristics of fibers – preparation, properties and applications of Nylon -6, 6 and Dacron. Fiber reinforced plastics (FRP) – Applications.

Rubbers and Elastomers: Natural rubber and its vulcanization – compounding of rubber. – Preparation – properties and applications of Buna-S and Thiokol rubber.

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

UNIT-IV

ENERGY SOURCES:

Fuels: Classification of fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking – moving bed catalytic cracking, Knocking – octane and cetane rating, synthetic petrol-Fischer- Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG. Analysis of Flue gas by using Orsat's apparatus.

Combustion: Definition, Calorific value of fuel – HCV, LCV; Determination of calorific value of solid fuels by using Bomb Calorimeter.

UNIT-V

ENGINEERING MATERIALS:

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

Refractories: Classification and characteristics of refractories, properties and application of Refractories.

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

Nano materials: Introduction to nano technology, preparation ,properties and applications of carbon nano tubes(CNTs)

Text books:

1) Engineering Chemistry by P.C Jain and M.Jain, Dhanpatrai Publishing Company, New Delhi(2010)
2) Engineering Chemistry by Rama Devi ,Venkata Ramana Reddy and Rath, Cengage learning, New Delhi.(2016)

Reference Books:

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

ENGINEERING MECHANICS

I -B.Tech.-I-Sem **L T P C**
Subject Code: 17ME1104ES **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	analyze the resultant of a system of forces using principles of mechanics	3	2	1
CO2	apply the conditions of static equilibrium to particles and rigid bodies	3	2	1
CO3	determine mechanical efficiency of simple lifting machines, centroid and centre of gravity of simple sections	3	2	1
CO4	compute the second moment of inertia of various laminas and bodies	3	2	1
CO5	solve the problems involving kinetics and virtual work of particles	3	2	1

UNIT-I
Introduction to Mechanics: Basic Concepts, system of Forces, Resolution of Coplanar Concurrent Forces and Space Force system – Moment of Forces and its Applications - Couples and Resultant of Force Systems - Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems.

UNIT-II
Friction: Types of friction – Limiting friction –Laws of Friction – Static and Dynamic Frictions- Motion of Bodies – Wedge Screw, screw- jack.

UNIT-III
Centroid and Center of Gravity: Introduction – Centroids of Lines – Centroids of area- Centroids of Composite figures- Pappu's theorems –Centre of Gravity of Bodies – Centroids of Volumes – Centre of gravity of composite bodies

UNIT-IV
Area moments of Inertia: Introduction – Definition of Moment of Inertia –Polar Moment of Inertia – Radius of gyration. Transfer Theorem for moment of inertia – Moments of inertia by integration – Moments of Inertia of Composite Figures.

Mass Moment of Inertia: Introduction – Moment of Inertia of Masses – Radius of gyration – Transfer Formula for Mass Moments of Inertia – Mass moments of inertia by integration – Mass moment of inertia of composite bodies.

UNIT-V
Kinetics: Kinetics of a particle – D'Alemberts principle. Work - energy and power. Principle of conservation of energy- Kinetics of rigid body in translation and rotation- work done – Principle of work – energy.

Text Books:
1. Singer's Engineering Mechanics Statics and Dynamics/ K. Vijaya Kumar Reddy, J.Suresh Kumar/ BSP
2. Engineering Mechanics/ Irving Shames, G.Krishna Mohan Rao / Prentice Hall
3. S. Timoshenko, D. H. Young, J V Rao and Sukumar Pati, Engineering Mechanics, 5th edition, McGraw Hill Education (India) Private Limited,

References:
1. A Text of Engineering Mechanics /YVD Rao/ K.Govinda Rajulu / M. Manzoor Hussain/ Academic Publishing Company
2. Engineering Mechanics: Statics and Dynamics, A.Nelson Mc Graw Hill Education.

COMPUTER PROGRAMMING

I-B.Tech.-I-Sem **L T P C**
Subject Code: 17ME1105ES **3 1 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	write simple programs using C language	3	3	2	2
CO2	design structured programs using functions	3	3	2	2
CO3	develop programs using arrays, strings and pointers	3	3	2	2
CO4	construct programs for heterogeneous data	3	3	2	2
CO5	implement various file operations in C programming	3	3	2	2

UNIT – I
Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Program Development, algorithms and flowcharts. Introduction to C Language – Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output, Operators(Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements- Selection Statements(making decisions) – if and switch statements, Repetition statements (loops)-while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Simple C Program examples.

UNIT – II
Functions-Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Limitations of recursion, example C programs.
Arrays – Concepts, using arrays in C, inter function communication, array applications- linear search, binary search and bubble sort, two – dimensional arrays, multidimensional arrays, C program examples.

UNIT – III
Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, Pointer Applications-Arrays and Pointers, Pointer Arithmetic and arrays, Passing an array to a function, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions.
Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

UNIT – IV
Enumerated, Structure and Union Types – The Type Definition (typedef), Enumerated types, Structures –Declaration, initialization, accessing structures, operations on structures, Complex structures-Nested structures, structures containing arrays, structures containing pointers, arrays of structures, structures and functions, Passing structures through pointers, self referential structures, unions, bit fields, C programming examples, command–line arguments, Pre processor commands.

UNIT – V
Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling), Positioning functions (fseek, rewind and ftell), C program examples.

Text Books:

1. Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.
2. Programming in C. P. Dey and M Ghosh , Second Edition, Oxford UniversityPress.

Reference Books:

1. The C Programming Language, B.W. Kernighan and Dennis M. Ritchie, Second Edition, Pearsoneducation.
2. Programming with C, B. Gottfried, 3rdedition, Schaum's outlines, McGraw Hill Education (India) Pvt Ltd.
3. C From Theory to Practice, G S. Tselikis and N D. Tselikas, CRCPress.
4. Basic computation and Programming with C, Subrata Saha and S. Mukherjee, Cambridge UniversityPress.

ENGINEERING PHYSICS / ENGINEERING CHEMISTRY LAB

I -B.Tech.-I-Sem **L T P C**
Subject Code: 17ME1106BS **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	identify modulus of elastic materials , determine the characteristics & applications of LED and SOLAR CELL, find the energy gap of a semiconductor and analyze the wavelength of laser source	3
CO2	demonstrate the resonance of LCR circuit, determine Time Constant of RC circuit & find variation of the magnetic field and determine losses in optical fiber	3
CO3	determine the hardness, viscosity and pH of various samples	3
CO4	synthesize the drug used in pharmaceutical industry	3
CO5	estimate the strength of solutions and amount of coloured solutions	3

List of Engineering Physics Lab Experiments: (Any 08 experiments compulsory)

1. To determine the Rigidity modulus of a wire - Torsional pendulum.
2. Study the characteristics of LED and LASER Diode.
3. Verify the characteristics of a Solar Cell.
4. Determination of wavelengths of a LASER source-Diffraction Grating.
5. Bending Losses of Fibers & Evaluation of numerical aperture of given fiber.
6. Energy gap of a semiconductor diode.
7. Determination of Resonance frequency of an LCR circuit.
8. To calculate the Time constant of an R-C Circuit.
9. Determination of frequency of an Electronic Vibrator – Melde's Exp.
10. Magnetic field along the axis of current carrying coil-Stewart and Gee's method.
11. Newton's Rings-Radius of curvature of Plano convex lens.
12. Dispersive power of the material of a prism – Spectrometer.

Laboratory Manual:

1. Laboratory Manual of Engineering Physics by Dr.Y.Aparna & Dr.K.Venkateswara Rao (V.G.S Publishers)
2. Solar photo voltaic – Technology Fundamentals system: A manual for Technics, Trainers & Engineers.

List of Engineering Chemistry Lab Experiments: (Any 08 experiments compulsory)

I) Volumetric Analysis:

1. Estimation of Ferrous ion by Permanganometry.
2. Estimation of Ferrous and ferric ions in a given mixture by Dichrometry.
3. Estimation of hardness of water by Complexometric method using EDTA
4. Estimation of copper by Iodometry.
5. Estimation of percentage of purity of Mno_2 in pyrolusite.

II) Instrumental methods of Analysis:

Conductometry:

6. Estimation of HCl by Conductometry.
7. Estimation of HCl and Acetic acid in a given mixture by Conductometry.

Potentiometry:

8. Estimation of HCl by potentiometry.

Colorimetry:

9. Estimation of manganese in $KMnO_4$ by colorimetric method

p^H meter:

10. Estimation of HCl by p^H meter.

Physical property:

11. Determination of viscosity of oil by redwood / Oswald's Viscometer.

Preparations:

12. Preparation of Aspirin.

Laboratory Manual:

1. Vogel's Text Book of quantitative chemical Analysis, 5th Edition (2015) G.H.jeffery, J.Bassett, J.Mendham and R.C.Denney.
2. A text Book on experiments and calculations in Engineering Chemistry by S.S. Dara S.chand&company Ltd., Delhi (2003).

COMPUTER PROGRAMMING IN C LAB

I-B.Tech.-I-Sem **L T P C**
Subject Code: 17ME1107ES **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	execute simple programs using C compiler	3
CO2	apply control statements in designing programs	3
CO3	design programs using functions, arrays, strings and pointers	3
CO4	construct programs for heterogeneous data	3
CO5	implement various file operations in C programming	3

Week1: Basics

1. Write a program to print sample strings like "hello world", "Welcome to C Programming" with different formats using escape sequences.
2. Write a Program to print different data types in „C" and their ranges.
3. Write a Program to initialize, assignment & printing variables of different data types.

Week2: Operators

1. Write a Program to demonstrate arithmetic operators. (+,-,*,/,%)
2. Write a Program to demonstrate logical operators.(logical AND, logical OR)
3. Write a Program to read radius value from the keyboard and calculate the area of circle and print the result in both floating and exponential notation.
4. Write a Program to calculate simple interest.
5. Write a Program to convert temperature. (Fahrenheit –Centigrade and vice-versa)

Week3: Operators

1. Write a Program to demonstrate relational operators.(<,>,<=,>=,==,!=)
2. Write a program to check equivalence of two numbers using conditional operator.
3. Write a Program to demonstrate pre increment and post increment.(++a, a++ where a is a Value to be initialized)
4. Write a program for computing the volume of sphere, cone and cylinder assume that Dimensions are integers use type casting where ever necessary.

Week4: Decision Statements

1. Write a Program to read marks of a student in six subjects and print whether pass or fail (Using if-else).
2. Write a Program to calculate roots of quadratic equation (using if-else).
3. Write a Program to calculate electricity bill. Read starting and ending meter reading.
   The charges are as follows.

No. of Units Consumed Rate in(Rs)
1-100 1.50 per unit
101-300 2.00 per unit for excess of 100 units
301-500 2.50 per unit for excess of 300 units
501-above 3.25 per unit for excess of 500 units

Week5: Switch operations

1. Write a Program to perform arithmetic operations using switch case.
2. Write a Program to display colors using switch case (VIBGYOR).
3. Write a Program to display vowels and consonants using switch case.
4. Write a Program to display names of days in a Week using switch case.

Week6: Basic Loop operations

Do the Following Programs Using for, while, do-while loops.
1. Write a program to calculate sum of individual digits of a given number.
2. Write a program to check whether given number is palindrome or not.
3. Write a program to print prime numbers in the given range.
4. Write a program to display multiplication tables from 1 to 10 except 3 and 5.

Week7: Advanced loops

1. Write a program to print the Fibonacci series for given „N‟ value.
2. Write a program to check whether a given number is a Fibonacci number or not.
3. Write a program to read 2 numbers x and n then compute the sum of the Geometric Progression. 1+x+ x2+x3+ - - - - - - - +xn
4. Write a program to print the following formats.

1	*
1 2	* *
1 2 3	* * *
1 2 3 4	* * * *

5. Write a C Program to construct pyramid of numbers.

Week8: 1-D arrays

1. Write a program to store 10 elements in the 1-D array and print sum of the array.
2. Write a program to print minimum and maximum elements in the 1-D array.
3. Write a program to count no. of positive numbers, negative numbers and zeros in the array.
4. Write a program to search the given element by using linear search and binary search.
5. Write a program to sort the given elements using bubble sort technique.

Week9: 2-D arrays

1. Write a program to perform matrix addition
2. Write a program to perform matrix multiplication by checking the compatibility.
3. Write a program to print the transpose of a matrix.

Week10: Functions

1. Write a program to find sum of two numbers using functions.
2. Write a program to find product of two numbers using functions without arguments, without return type.
3. Write a program to find difference of two numbers using functions without arguments, with return type.
4. Write a program to find sum of two numbers using functions with arguments &without return type.
5. Write a program to find product of two numbers using functions with arguments, with return type.

Week11: Functions and Recursion
1. Write a program to swap two numbers using
   a) Call By Value B) Call By Reference.
2. Write a program to calculate factorial, gcd using recursion and non-recursion functions.
3. Write C program that reads two integers x and n and calls a recursive function to compute x^n
4. Write a C program that reads two integers and calls a recursive function to compute ncr

Week 12: Math Functions and I/O Functions
1. Write a program to read values from keyboard and find the values using abs(),sqrt(),floor(),ceil()and pow().
2. Write a program to read and display a value using getch () and putch().
3. Write a program to read and display a value using getchar(), putchar(),gets() and puts().

Week 13: Strings

1. Write a program to perform various string manipulations using built-in functions.
2. Write a program to print the given strings in ascending order.
3. Write a program to verify the given string is palindrome or not (without built-in functions, with using built-in functions).
4. Write a program to concatenate two strings using arrays

.

Week14: Structures

1. Write a program to create structure for an account holder in a bank with following Fields: name, account number, address, balance and display the details of five account holders.
2. Write a program to find total marks of individual student and average marks for 10 students using structures.
3. Write a program to create structure called traveler and members of structure are train no, coach no, seat no, source ,destination , gender, age, name and departure date.
4. Write a program to illustrate passing an entire structure to a function.
5. Write a C Program to perform addition and multiplication of two complex numbers using structures.

Week15: File operations

1. Write a program which copies the contents of one file to another file.
2. Write a program to reverse the first n characters in a file.
3. Write a C program to merge two files into a third file (i.e., the contents of the firs t file followed by those of the second are put in the third file).
4. Write a C program to count the number of times a character occurs in a text file.

Reference Books:

1. Problem Solving and Program Design in C, 4th edition, by jeri R. Hanly and Elli B.Koffman.
2. Programming in C by Pradip Dey, Manas Ghosh 2nd edition Oxford University Press.
3. E.Balaguruswamy, Programming in ANSI C 5th Edition McGraw-Hill
4. A first book of ANSI C by Gray J.Brosin 3rd edition Cengagedelmer Learning India P.Ltd
5. AL Kelly, Iraphol,Programming in C,4th edition Addison-Wesley – Professional
6. Brain W.Kernighan & Dennis Ritchie, C Programming Language, 2nd edition, PHI

IT & ENGINEERING WORKSHOP

I-B.Tech.-I-Sem. **L T P C**
Subject Code: 17ME1108ES **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO5	PO9	PO10
CO1	install and make use of operating systems and MS office tools	3	3	2	2
CO2	configure fire walls and trouble shoot network connections	3	3	2	2
CO3	apply safety norms while handling the workshop equipment	3	1	3	2
CO4	prepare required models using various engineering trades	3	1	3	2
CO5	make use of various power tools	3	1	3	2

LIST OF EXPERIMENTS

Part A- IT Workshop

Week-1: WINDOWS OPERATING SYSTEM & DRIVERS INSTALLATION
Windows 7, Windows 8 and Windows 10. LAN, graphics, audio, video and command prompt, commands.

Week-2: NETWORK CONNECTIONS & TROUBLESHOOTING
IP configurations, connecting devices in LAN through bridge, hub, switch; Wi-Fi, Li-Fi and Bluetooth settings; Crimping: Crossover, strait over.
Hardware, troubleshoots, software troubleshooting.

Week-3: Cyber Hygiene: Introduction to Virus, worms, threats. Threats on internet, Configure the Systems to be internet safe, Install antivirus, personal firewall, block pop-ups, block active x downloads.

Week-4: MS WORD
Prepare the project document and resume.

Week-5 : MS EXCEL
Spreadsheet basics, modifying worksheets, formatting cells, formulas and functions, sorting and filtering, charts.

Week-6: MS POWER POINT
Power point screen, working with slides, add content, work with text, working with tables, graphics, slide animation, reordering slides, adding sound to a presentation.

Part B- Engineering Workshop

Week-7: HOUSE WIRING
Power point, light fitting and switches.

Week-8 & 9: CARPENTRY
Study of tools and joints; Practice in planning, chiseling, marking and sawing; Joints: Cross joint, T joint, Dove tail joint.

Week-10,11 &12: FITTING
Study of tools, practice in filing, cutting, drilling and tapping; Male and female joints, stepped joints**.**

Week-13 & 14: Tin Smithy & Black Smithy
Tin smithy:-Preparation of Open scoop, Cylinder, square/rectangular tray, **Black Smithy**:-S-Hook, Square /Hexagonal headed bolt.

Week 15: Demonstration of Power Tools: - Bench drilling machine, hand drilling machine, power hacksaw, grinding machine and wood cutting machine.

Text Books:

1. Peter Norton, ―Introduction to Computers, Tata Mc Graw Hill Publishers, 6th Edition, 2010.
2. Scott Muller, Que,-Upgrading and Repairing‖, Pearson Education, PC's 18th Edition, 2009.
3. Microsoft Office 2016 Step by Step (Microsoft)
4. H. S. Bawa, -Workshop Practice‖, Tata Mc Graw Hill Publishing Company Limited, New Delhi, 2nd Edition, 2007.

NATIONAL SERVICE SCHEME (NSS) / PHYSICAL EDUCATION / YOGA
MANDATORY COURSE (NON-CRIDIT)

I-B.Tech.-I-Sem. **L T P C**
Subject Code: 17AC1108MC **0 0 2 -**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO6	PO8	PO9	PO12
CO1	harness physical literacy and lifelong engagement	3	3	3	3	3
CO2	use aesthetic appreciation	2	1	2	3	3
CO3	build competence and confidence to face challenges	1	2	1	3	3
CO4	develop Sports related values and attitudes	3	3	2	2	3
CO5	follow appropriate etiquette and sports	1	1	2	3	3

Aim of NSS Programme: The programme aims to inculcate social welfare in students, and to provide service to society without bias. NSS volunteers work to ensure that everyone who is needy gets help to enhance their standard of living and lead a life of dignity. In doing so, volunteers learn from people in villages how to lead a good life despite a scarcity of resources. It also provides help in natural and man-made disasters by providing food, clothing and first aid to the disaster victims. The Main Objectives and outcomes are:

S.No.	Name of the Activity	S.No.	Name of the Activity
1	First-aid	9	Anti-Ragging Awareness
2	Blood donation camp	10	Social Activities Awareness
3	Traffic awareness program	11	Cyber Crime
4	Environmental Awareness	12	Digital India
5	Swachh Bharat Abhiyan	13	Substance Abuse Awareness Program (SAAP)
6	Health awareness program	14	Telanganaku Haritha Haram (Sapling Plantation)
7	Fire Safety Awareness	15	Garments / Essential Education Material Collection and distribution
8	Non-formal education		

Aim of Physical Education: The aim of course is to make Physical Education as an integral part of Educational System. Students studying in the colleges should have the benefit of Physical Education to improve their health during the course of college education. It is designed to ensure that on completion of this training they would attain the minimum prescribed standard.

Name of the Individual Event		Name of the Team Event	
S.No.	Event	S.No.	Event
1	Badminton	1	Basketball
2	Gymnastics	2	Football
3	Judo	3	Hockey
4	Swimming	4	Kabaddi
5	Table Tennis	5	Kho –Kho
6	Tennis	6	Volleyball
7	Weight Lifting and Power Lifting	7	Cricket
8	Wrestling	8	Hand ball
9	**Yoga**	9	Throw ball
10	Archery	10	Badminton
11	Body Building	11	Table Tennis
12	Carroms	12	Tennis
13	Chess	13	Swimming
14	Boxing	14	Carroms
15	Taekwondo	15	Taekwondo
16	Fencing	16	Fencing
17	Athletics	17	Athletics

I-B.TECH.-II-SEMESTER SYLLABUS

ENGINEERING MATHEMATICS – II
(Vector Calculus, Fourier Analysis & PDE)
(Common to all Branches)

I-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME1201BS **4 1 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	solve ODE by using Laplace transforms	3	2	1
CO2	determine vector field, scalar field, gradient, divergence and curl by using vector differentiation	3	2	1
CO3	solve the line, surface and volume integrals by using vector integration	3	2	1
CO4	find periodic functions in terms of Fourier series and non-periodic functions of Fourier transform	3	2	1
CO5	formulate Partial Differential Equation, solve Linear and non-linear Differential Equations and analyze one dimensional heat and wave equation	3	2	1

Unit I
Laplace Transforms: Laplace transforms of standard functions–Shifting Theorems, Transforms of derivatives and integrals–Unit step function–Dirac delta function Laplace Transform of Periodic Functions. Inverse Laplace transforms by Partial fractions–Convolution theorem (with proof)-Application of Laplace transforms to ordinary differential equations with constant coefficients

Unit II
Vector Differentiation: Scalar and vector point functions, Gradient, Divergence, Curl and their physical and geometrical interpretation, Laplacian operator, Vector identities.

Unit III
Vector Integration: Line Integral, Work done, Potential function, area, surface and volume integrals, Vector integral theorems: Greens, Stokes and Gauss divergence theorems (without proof) and related problems

Unit IV
Fourier Series and Transformations: Fourier series–even and odd functions–Half-range sine and cosine series, Fourier integral theorem (without proof)–Fourier transforms–sine and cosine transforms–properties–inverse transforms–Finite Fourier transforms
Fourier Transform of Convolution Products (Without Proof)

Unit V
Partial Differential Equations and Applications: Formation of partial differential equations-by elimination of arbitrary constants and arbitrary functions– solutions of first order linear (Lagrange) equations and nonlinear equations (Four standard types)–Method of Separation of Variables-Applications to wave equation, heat conduction equation in one dimension.

Textbook (s)
1. B. S. Grewal, Higher Engineering Mathematics, 42nd Ed.,Khanna Publishers, New Delhi
2. S. R. K. Iyengar, R. K. Jain,Advanced Engineering Mathematics,4th Ed., Narosa Publishing House, New Delhi, 2014
3. Advanced Engineering Mathematics, V.O.Neil, Cengage Publications

References
1. T.K.V.Iyengar, B. Krishna Ghandhi, S. Ranganathan and M.V. S.S.N. Prasad, Engineering Mathematics, 12th Ed.,Volume–I, S. Chand Publishers, 2014

PROFESSIONAL COMMUNICATION IN ENGLISH

I-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME1202HS **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO10	PO12
CO1	apply appropriate vocabulary and grammar	3	1
CO2	use effective writing skills in formal and informal situations	3	1
CO3	demonstrate reading skills to pursue research and academic activities	3	1
CO4	apply and exhibit professional and social Etiquette	3	1
CO5	employ reference and study skills for lifelong learning	3	1

SYLLABUS

Reading Skills:
Objectives:
To develop an awareness in students about the significance of silent reading and comprehension.
To develop students' ability to guess meanings of words from the context and grasp the overall message of the text, draw inferences, etc., by way of:

- Skimming and Scanning the text
- Intensive and Extensive Reading
- Reading for Pleasure
- Identifying the topic sentence
- Inferring lexical and contextual meaning
- Recognizing Coherence/Sequencing of Sentences

NOTE: The students will be trained in reading skills using the prescribed texts for detailed study. They will be tested in reading comprehension of different 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.

Writing Skills:
Objectives:

1. To develop an awareness in the students about writing as an exact and formal skill
2. To create an awareness in students about the components of different forms of writing, beginning with the lower order ones through;
   - Writing of sentences
   - Use of appropriate vocabulary
   - Paragraph writing
   - Coherence and cohesiveness
   - Narration / description
   - Note Making
   - Formal and informal letter writing
   - Describing graphs using expressions of comparison

In order to improve the proficiency of the students in the acquisition of language skills mentioned above, the following text and course contents, divided into Five Units, are prescribed:

Text Books:

- "Fluency in English – A Course book for Engineering Students" by Board of Editors: Hyderabad: Orient Black Swan Pvt. Ltd. 2016. Print.
- "Fluency in English – A Practice Manual" for B.Tech I year I Sem (ECE&CE) & II Sem (CSE & ME) comprising the Five Units and practice exercises for all the topics.

Note: Listening and Speaking skills are covered in the syllabus of ELCS Lab.

UNIT –I: Motivation
Chapter entitled '**Presidential Address' by Dr. A.P.J. Kalam** from "Fluency in English– A Course

book for Engineering Students" published by Orient Blackswan, Hyderabad.

- **Vocabulary**: Word Formation — Root Words –The Use of Prefixes and Suffixes– Changing Words from one form to another – Transition Words - Exercises for Practice.
- **Grammar:** Punctuation – Parts of Speech- Articles – Prepositions-Types & Kinds –Exercises for Practice with focus on identifying Errors.
- **Reading:** Double Angels by David Scott-Reading and Its Importance- Techniques for Effective Reading- Signal Words- Exercises for Practice
- **Writing:** Writing Sentences- Techniques for Effective Writing– Paragraph Writing- Types, Structure and Features of a Paragraph-Coherence and Cohesiveness: Logical, Lexical and Grammatical Devices – Patterns of Writing - Cause and Effect - Classification and Division - Compare and Contrast - Definition - Description - Exemplification - Narration - Persuasion - Process - Exercises for Practice

UNIT –II: Leadership

Chapter entitled Satya Nadella: **Email to Employees on his First Day as CEO** from "Fluency in English– A Course book for Engineering Students" Published by Orient Black Swan, Hyderabad.

- **Vocabulary**: Collocations - Synonyms and Antonyms – Homonyms, Homophones, Homographs- Exercises for Practice
- **Grammar:** Verbs-Transitive, Intransitive and Non-finite Verbs –Gerund – Exercises for Practice with focus on identifying Errors.
- **Reading:** Sub-skills of Reading- Skimming, Scanning, Extensive Reading and Intensive Reading – **The Road Not Taken by Robert Frost** — Exercises for Practice
- **Writing**: Letter Writing –Format, Styles, Parts, Language to be used in Formal Letters- Letter of Apology – Letter of Complaint-Letter of Inquiry with Reply – Letter of Requisition –- Exercises for Practice

UNIT –III: Human Relations

Chapter entitled The **Gift of the Magi** by **O Henry** from the Course/Study Material.

- **Vocabulary:** Introduction- A Brief History of Words – Using the Dictionary and Thesaurus– Confusables- Spellings
- **Grammar:** Tenses: Present Tense- Past Tense- Future Tense- Active Voice – Passive Voice- Conditional Sentences – Adjective and Degrees of Comparison – Adverbs - Exercises for Practice with focus on identifying Errors.
- **Reading: The Cuddalore Experience** by **Anu George** -Improving Comprehension Skills – Techniques for Good Comprehension- Skimming and Scanning- Non-verbal Signals – Structure of the Text – Structure of Paragraphs – Punctuation – Author's viewpoint (Inference)
- **Anticipation:** Determining the Meaning of Words – Summarizing- Typical Reading Comprehension Questions.
- **Writing:** Introduction- Letter Writing-Writing the Cover Letter- Cover Letters Accompanying Resumes- E-Correspondence – Emails – Social Networks – Dos and Don'ts.

UNIT –IV: Human Values and Professional Ethics

Chapter entitled **'Good Manners' by J.C. Hill** from Fluency in English – A Course book for Engineering Students" published by Orient Blackswan, Hyderabad.

- **Vocabulary**: Phrasal Verbs - Idiomatic Expressions –One- word Substitutes – Analogies (Exercises for Practice.)
- **Grammar:** Sequence of Tenses- Concord (Subject in Agreement with the Verb) – Exercises for Practice with focus on identifying Errors.
- **Reading:** '**If' poem by Rudyard Kipling**–Tips for Writing a Review — Author's Viewpoint – Reader's Anticipation– Herein the Students will be required to Read and Submit a Review of a Book (Literary or Non-literary) of their choice – Exercises for Practice.
- **Writing**: Information Transfer-Bar Charts-Flow Charts-Tree Diagrams etc., — Exercises for Practice. Introduction – Steps to Effective Précis Writing – Guidelines- Samples

UNIT –V: Wisdom

Chapter entitled '**Father Dear Father' by Raj Kinger** from Fluency in English – A Course book for Engineering Students" Published by Orient Black Swan, Hyderabad

- **Vocabulary:** Foreign Words—Words borrowed from other Languages- Exercises for Practice

- **Grammar**: Direct and Indirect Speech- Question Tags- Common Errors in English - Exercises for Practice with focus on identifying Errors**.**
- **Reading**: Predicting the Content- Understanding the Gist – SQ3R Reading Technique- Study Skills – Note Making - Understanding Discourse - Coherence – Sequencing Sentences.
- **Writing:** Technical Reports- Introduction – Characteristics of a Report – Categories of Reports – Formats- Prewriting – Structure of Reports (Manuscript Format) – Types of Reports – Writing the Report - Exercises from both the texts not prescribed shall be used for classroom tasks.

References

1. Prof. N. Krishna Swamy Modern English A Book of Grammar, Usage and Composition
2. Prof. Krishna Swamy and Sri Ram
3. Green, David. Contemporary English Grammar –Structures and Composition. MacMillan India. 2014 (Print)
4. Rizvi, M. Ashraf. Effective Technical Communication. Tata Mc Graw –Hill. 2015 (Print)
5. Raman, Meenakshi and Sharma, Sangeeta. "Technical Communication- Principles and Practice". Third Edition. New Delhi: Oxford University Press. 2015. Print.
6. Text for Communication Skills- Current English for Colleges – N. Krishnaswamy & T. Sriram - Mc Millian.
7. English for Science and Technology by.Prof.P.Ramani, Mc Millan
8. The Structure of Technical English - A.J.Hebert, Orient Longman
9. Communication in English for Technical Students – Curriculum Development Centre, Calcutta, Orient Longman
10. Business letters for Different Occasions - A.N. Kapoor, S.Chand & Company Pvt. Ltd.
11. Writing That Works: How to Communicate Effectively in Business by Kenneth Roman
12. Words that Sell by Richard Bayan
13. Business Writing Today: A Practical Guide by Natalie Canavor
14. A Course in English Grammar by Raj N Bakshi Orient Black Swan Pvt. Ltd. 2000. Print
15. O Henry 100 Short Stories
16. Novels and Short Story collections of W. Somerset Maugham
17. Selected Writings of R.K Narayan
18. Wings of Fire by APJ Kalam
19. Literary Horizon Orient Black Swan Pvt. Ltd. 2013
20. The Gardener by Rabindranath Tagore

BASIC ELECTRICAL & ELECTRONICS ENGINEERING

I-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME1203ES **4 1 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	solve electrical circuits using circuit laws and explain single phase AC circuits	3	3	2	1
CO2	solve electrical circuits using network theorems and illustrate diode characteristic	3	3	2	1
CO3	identify special purpose devices and use diode circuits for various applications	3	3	2	1
CO4	illustrate the configurations and biasing techniques of Bi-polar junction transistor	3	3	2	1
CO5	characterize JFET	3	3	2	1

UNIT-I: INTRODUCTION TO ELECTRICAL CIRCUITS & SINGLE PHASE AC CIRCUITS

Electrical Circuits: R-L-C Parameters, Voltage and Current, Independent and Dependent Sources, Source Transformation – V-I relationship for passive elements, Kirchhoff's Laws, Network reduction techniques – series, parallel, series-parallel, star-to-delta, delta-to-star transformation, Nodal Analysis & Mesh Analysis.

Single Phase AC Circuits: R.M.S. and Average values, Form and peak factor, steady state analysis of series, parallel and series-parallel combinations of R, L and C with sinusoidal excitation, concept of reactance, impedance, susceptance and admittance – phase and phase difference, Concept of power factor, j-notation, complex and polar forms of representation.

UNIT-II: NETWORK THEOREMS & P-N JUNCTION DIODE

Network Theorems: Thevenin's, Norton's, Maximum power transfer, Superposition, Reciprocity, Tellegen's Millman's and compensation theorems for DC and AC excitations.

P-N Junction Diode: Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances.

UNIT- III: SPECIAL PURPOSE DEVICES & DIODE CIRCUITS

Special Purpose Devices: Breakdown Mechanisms in Semi-Conductor Diodes, Zener diode characteristics, Use of Zener diode as simple regulator, Principle of operation and Characteristics of Tunnel Diode (With help of Energy band diagram) and Varactor Diode.

Rectifiers and Filters: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

UNIT- IV: BIPOLAR JUNCTION TRANSISTOR

Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations. Comparison of CE, CB and CC configurations

Transistor Biasing And Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Emitter Feedback Bias, Collector to Emitter feedback bias, Voltage divider bias, Bias stability, Stabilization against variations in V_{BE} and β, Bias Compensation using Diodes and Transistors. Principle of operation of SCR.

UNIT- V: JUNCTION FIELD EFFECT TRANSISTOR

Junction Field Effect Transistor: Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, Small Signal Model, Biasing FET.

Text Books:

1. Circuit Thoery (Analysis and synthesis) - A. Chakrabarti, Dhanpat Rai&co (Pvt) Ltd 7th Ed,2015
2. Electrical Technology Vol-I B.L. Theraja. S. Chand publications
3. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
4. Integrated Electronics – J.Millman and C.C.Halkias, Satyabratajit, TMH.
5. Basic Electrical and electronics Engineering- M S Sukija TK Nagasarkar Oxford University.

References:

1. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition
2. Introduction to Electronic Devices and Circuits-Rober T. Paynter, Pearson Education.
3. Electronic Devices and Circuits - K. Lal Kishore, B.S. Publications, 2nd Edition, 2005.
4. Electronic Devices and Circuits – Anil K. Maini, Varsha Agarwal –Wiley India Pvt. Ltd. 1/e 2009.
5. Linear circuit analysis (time domain phasor and Laplace transform approaches)- 2nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
6. Network Theory by N.C.Jagan & C.Lakshminarayana, B.S. Publications.
7. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
8. Electronic Devices and Circuits – 2nd Edition by Muhammad H.Rashid, Cengage Learning.

ENGINEERING GRAPHICS

I-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME1204ES **2 0 3 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO5	PO10
CO1	apply engineering drawing concepts in technical graphic communication	3	3	2
CO2	construct conic sections using various methods	3	3	2
CO3	draw orthographic projections of points, lines, planes and solids	3	3	2
CO4	draw development of solid surfaces	3	3	2
CO5	draw the conversions of orthographic to isometric projections & vice versa	3	3	2

UNIT – I
INTRODUCTION TO ENGINEERING DRAWING: Principles of Engineering Graphics and their significance, Conic Sections - ellipse, parabola, hyperbola, including the Rectangular Hyperbola. Cycloid, Epicycloid and Hypocycloid, Involute. Scales – Plain and Diagonal.

UNIT- II
ORTHOGRAPHIC PROJECTIONS: Principles of Orthographic Projections – Conventions – Projections of Points and Straight Lines. Projections of Plane regular geometric figures. - Auxiliary Planes.

UNIT – III
Projections of Regular Solids - Auxiliary Views.

UNIT – IV
Sections and developments; Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.
Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone.

UNIT – V
ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple Solids. Conversion of Isometric Views to Orthographic Views and Vice-versa.

TEXT BOOKS:
1. Engineering Drawing N.D. Bhatt / Charotar
2. A Text Book of Engineering Drawing / basant agarwal.
3. Engineering Drawing and Graphics Rane and Shah/ Pearson Edu.

REFERENCE BOOKS:
1. A Text Book of Engineering Drawing / Dhawan R K / S. Chand
2. Engineering Graphics with Auto CAD / James D Bethune / Pearson Edu.
3. Engineering Graphics / K R Mohan / Dhanpat Rai.

DATA STRUCTURES THROUGH C

I-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME1205ES **3 1 - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	classify different data structures to design efficient programs	3	3	2	2
CO2	identify appropriate sorting and searching techniques	3	2	2	2
CO3	illustrate operations and applications of linear data structures	3	3	2	2
CO4	explain various concepts of non-linear data structures	3	3	2	2
CO5	choose an appropriate hashing technique for a given problem	3	3	2	2

UNIT – I
INTRODUCTION TO DATA STRUCTURES, SEARCHING AND SORTING: Basic concepts: Introduction to data structures, classification of data structures, operations on data structures, abstract data type, algorithms, different approaches to design an algorithm, recursive algorithms; Searching techniques: Linear search, binary search and Fibonacci search; Sorting techniques: Bubble sort, selection sort, insertion sort, quick sort, merge sort, and comparison of sorting algorithms.

UNIT – II
LINEAR DATA STRUCTURES: Primitive operations, implementation of stacks using Arrays, applications of stacks arithmetic expression conversion and evaluation; Queues: Primitive operations; Implementation of queues using Array, applications of linear queue, circular queue and double ended queue (deque).

UNIT – III
LINKED LISTS: Linked lists: Introduction, singly linked list, representation of a linked list in memory, operations on a single linked list; Applications of linked lists: Polynomial representation and sparse matrix manipulation. Types of linked lists: Circular linked lists, doubly linked lists; linked list representation and operations of Stack, linked list representation and operations of queue.

UNIT – IV
NON LINEAR DATA STRUCTURES: Trees: Basic concept, binary tree, binary tree representation, array and linked representations, binary tree traversal, binary search tree, tree variants, application of trees; Graphs: Basic concept, graph terminology, graph implementation, graph traversals, Application of graphs, Priority Queue.

UNIT – V
BINARY TREES AND HASHING: Binary search trees: Binary search trees, properties and operations; Balanced search trees: AVL trees; Introduction to M-Way search trees, B trees; Hashing and collision: Introduction, hash tables, hash functions, collisions, applications of hashing.

Text Books:
1. Mark A. Weiss, “Data Structures and Algorithm Analysis in C”, Pearson, 2nd Edition, 1996.
2. Ellis Horowitz, Satraj Sahni, Susan Anderson Freed, “Fundamentals of Data Structures in C”, Universities Press, 2nd Edition, 2008.

Reference Books:
1. Reema Thareja, “Data Structures using C”, Oxford University Press, 2nd Edition, 2014.
2. S. Lipschutz, “Data Structures”, Tata McGraw Hill Education, 1st Edition, 2008.
3. D. Samanta, “Classic Data Structures”, PHI Learning, 2nd Edition, 2004.
4. Tanenbaum, Langsam, Augenstein, “Data Structures Using C”, Pearson, 1st Edition, 2003.

ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

I-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME1206HS **0 0 3 2**

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

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO5	PO10
CO1	apply the sounds of English for proper pronunciation	3	3
CO2	use the right accent and intonation in formal and informal situations	3	3
CO3	distinguish and neutralize various accents for intelligibility	3	3
CO4	develop speaking and listening skills through audio-visual experiences	3	3
CO5	demonstrate employability skills through various activities	3	3

COMPUTER ASSISTED LANGUAGE LEARNING (CALL) LAB

Exercise – I
Introduction to Phonetics -Speech Sounds -Vowels and Consonants
Minimal Pairs- Consonant Clusters
Past Tense Marker and Plural Marker

Exercise – II
Structure of Syllables
Word Stress-Sentence Stress – Intonation
Basic Rules of Word Accent - Stress Shift

Exercise - III
Errors in Pronunciation-the Influence of Mother Tongue (MTI)
Common Indian Variants in Pronunciation – Differences between British and American Pronunciation

Exercise – IV
Listening for General Details
Listening Comprehension Tests

Exercise – V
Listening for Specific Details
Listening Comprehension Tests

Online Resources for Teaching Listening Skills
Listening for General & Specific Details
www.learnenglishteens.britishcouncil.org
http://learnenglishteens.britishcouncil.org/skills/listening-skills-practice
https://www.skillsyouneed.com/ips/listening-skills.html
https://www.youtube.com/watch?v=qYb0LCqqJbU
https://www.englishlistening.com/
http://esl-lab.com/
http://www.trainyouraccent.com/

Listening Comprehension Test
www.examenglish.com/IELTS/IELTS_listening.html
https://www.englishlistening.com/index.php/listen-to-passages/
www.examenglish.com/TOEFL/toefl_listening.html

INTERACTIVE COMMUNICATION SKILLS (ICS) LAB

Exercise – I
Ice-Breaking Activity - Introducing Oneself and Others
JAM Session

Exercise – II
Situational Dialogues – Greetings – Taking Leave
Role-Play- Expressions in Various Situations
Making Requests and Seeking Permissions
Telephone Etiquette

Exercise – III
Descriptions- Narrations
Giving Directions and Guidelines

Exercise – IV
Public Speaking – Exposure to Structured Talks
Non-verbal Communication
Presentation Skills
Making a Short Speech
Extempore- Making a Presentation

Exercise – V
Group Discussion- Interview Skills
Group Discussion Activity - Mock Interviews

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:**
   The Computer aided Language Lab for 40 students with 40 systems, one master console, LAN facility and English language software for self- study by learners.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

i) Computers with Suitable Configuration ii) High Fidelity Headphones

2. **Interactive Communication Skills (ICS) Lab :**

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

Lab Manuals:

1) A book entitled "***ELCS Lab Manual – A Workbook for CALL and ICS Lab Activities"*** by Board of Editors: Hyderabad: Orient BlackSwan Pvt. Ltd. 2016. Print.
2) Hart Steve; Nair, Aravind R.; Bhambhani, Veena. **"*EMBARK- English for undergraduates"*** Delhi: Cambridge University Press. 2016. Print.

References:

1. Jayashree Mohanraj. *Let Us Hear Them Speak*. New Delhi: Sage Texts. 2015. Print. Hancock, M. *English Pronunciation in Use. Intermediate Cambridge*: Cambridge University Press. 2009. Print.

DATA STRUCTURES THROUGH C LAB

I-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME1207ES **- - 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	implement various searching and sorting techniques	3
CO2	demonstrate basic operations of stack and queues using arrays and linked lists	3
CO3	apply stack data structure to solve various computing problems	3
CO4	demonstrate and apply different methods for traversing graphs	3
CO5	construct binary search tree	3

WEEK-1: SEARCHING TECHNIQUES

Write C programs for implementing the following searching techniques.

a. Linear search.
b. Binary search.
c. Fibonacci search.

WEEK-2: SORTING TECHNIQUES

Write C programs for implementing the following sorting techniques to arrange a list of integers in ascending order.

a. Bubble sort.
b. Insertion sort.
c. Selection sort.

WEEK-3: SORTING TECHNIQUES

Write C programs for implementing the following sorting techniques to arrange a list of integers in ascending order.

a. Quick sort.
b. Merge sort.

WEEK-4: IMPLEMENTATION OF STACK AND QUEUE

Write C programs to

a. Design and implement Stack and its operations using Arrays.
b. Design and implement Queue and its operations using Arrays.

WEEK-5: APPLICATIONS OF STACK

Write C programs for the following:

a. Uses Stack operations to convert infix expression into postfix expression.
b. Uses Stack operations for evaluating the postfix expression.

WEEK-6: IMPLEMENTATION OF SINGLE LINKED LIST

Write a C program that uses functions to perform the following operations on single linked list.
(i) Creation (ii) insertion (iii) deletion (iv) traversal

WEEK-7: IMPLEMENTATION OF CIRCULAR SINGLE LINKED LIST

Write a C program that uses functions to perform the following operations on Circular linked list.
(i) Creation (ii) insertion (iii) deletion (iv) traversal

WEEK-8: IMPLEMENTATION OF DOUBLE LINKED LIST

Write a C program that uses functions to perform the following operations on double linked list.
(i) Creation (ii) insertion (iii) deletion (iv) traversal in both ways.

WEEK-9: IMPLEMENTATION OF STACK USING LINKED LIST

Write a C program to implement stack using linked list.

WEEK-10: IMPLEMENTATION OF QUEUE USING LINKED LIST

Write a C program to implement queue using linked list.

WEEK-11: GRAPH TRAVERSAL TECHNIQUES

Write C programs to implement the following graph traversal algorithms:
a. Depth first search.
b. Breadth first search.

WEEK-12: IMPLEMENTATION OF BINARY SEARCH TREE

Write a C program that uses functions to perform the following:
a. Create a binary search tree.
b. Traverse the above binary search tree recursively in pre-order, post-order and in-order.
c. Count the number of nodes in the binary search tree.

Reference Books:

1. Kernighan Brian W, Dennis M. Ritchie, "The C Programming Language", Prentice Hall of India, Re-Print, 2008.
2. Balagurusamy E, "Programming in ANSI C", Tata Mc Graw Hill, 6th Edition, 2008.
3. Gottfried Byron, "Schaum's Outline of Programming with C", Tata Mc Graw Hill, 1st Edition, 2010.
4. Lipschutz Seymour, " Data Structures Schaum's Outlines Series", Tata Mc Graw Hill, 3rd Edition, 2014
5. Horowitz Ellis, Satraj Sahni, Susan Anderson, Freed, "Fundamentals of Data Structures in C", W. H.Freeman Company, 2nd Edition, 2011.

BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

I-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME1208ES **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4
CO1	design electrical circuits to verify circuit laws and network theorems	3
CO2	verify the V-I characteristics of various electronic devices	3
CO3	determine the efficiency of various rectifiers	3
CO4	illustrate the configurations of Bi-polar junction transistor	3
CO5	demonstrate the characteristics of FET and SCR	3

PART A:
ELECTRICAL & ELECTRONIC WORKSHOP PRACTICE (in 3 lab sessions)

1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Bread Boards,
2. Identification, Specifications and Testing of Active Devices, Diodes, BJT's, Low power JFET's, Power Transistors, LED's, LCD's, SCR.
3. Study and operation of
   - Multimeters (Analog and Digital)
   - Function Generator
   - Regulated Power Supplies
   - CRO

PART B:
(For Laboratory examination list of experiments – Minimum of 10 experiments to be conducted)

PART-1 ELECTRICAL LAB

1. Verification of KVL & KCL.
2. Verification of Superposition and Reciprocity theorems.
3. Verification of maximum power transfer theorem. Verification on DC, verification on AC with Resistive and Reactive loads.
4. Experimental determination of Thevenin's Theorem equivalent circuits and verification by direct test.
5. Experimental determination of Norton's Theorem equivalent circuits and verification by direct test.

PART-2 ELECTRONICS LAB

6. Forward and reverse bias characteristics of PN-Junction Diode.
7. Zenor diode V-I characteristics and Zenor diode as voltage regulator.
8. Half wave rectifier with & without filters.
9. Full wave rectifier with & without filters.
10. Input & output characteristics of Transistor in CB/CE configuration.
11. FET Characteristics.
12. SCR Characteristics.

Equipment required for Laboratory:

1. Regulated Power supplies (RPS) : 0-30 V
2. CRO's: 0-20 MHz
3. Function Generators: 0-1 MHz
4. Multimeters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital) : 0-20 µA, 0-50µA, 0-100µA, 0-200µA,10mA,20 mA
8. Voltmeters (Analog or Digital) : 0-30V,0-50V,
9. Electronic Components: Resistors, Capacitors, BJTs, SCRs, FETs, LEDs, Diodes-Ge & Si type, Transistors – NPN, PNP type

MICRO PROJECT
(MANDATORY NON-CREDIT COURSE)

I-B.Tech.-II-Sem. **L T P C**
Subject Code: 17AC1209MC **0 0 2 -**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1 to PO14
CO1	select problem and evaluate	3
CO2	review the literature related to the problem	3
CO3	implement principles of science and Engineering	3
CO4	analyze the problem	3
CO5	present the essence of project work	3

EVALUATION OF MICRO PROJECT:

1. The student has to select one suitable topic in consultation with course Counselor /advisor and get it approved and register with the Head of the Department.
2. The project is evaluated for 30 marks for internal and 70 marks for external.
3. The students shall be required to submit the rough draft of the project before the commencement of first mid examination.
4. Faculty shall make suggestions for modification in the rough draft.
5. Two copies of the final report should be submitted by the student within a week thereafter.
6. Presentation schedules will be prepared by Department in line with the academic calendar.

Guidelines for preparation and presentation of Micro Project:

The report should be prepared in the prescribed format which is available with concerned course advisor/Counselor. Similarly a 15 minutes power point presentation in a prescribed format should be given.

The evaluation of the Micro Project is based upon the following.

S.No	Description	Internal	External
1.	Content Covered	05 Marks	10 Marks
2.	Technicality involved	05 Marks	10 Marks
3.	Report quality	05 Marks	10 Marks
4.	Summary and findings	05 Marks	10 Marks
5.	PPT presentation	10 Marks	30 Marks
	Total	**30 Marks**	**70 Marks**

II-B.TECH.-I-SEMESTER SYLLABUS

STATISTICAL AND NUMERICAL METHODS

II-B.Tech.-I-Sem. **L T P C**
Subject Code: 17ME2101BS **4 1 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	differentiate among random variables involved in the probability models	3	2	1
CO2	test hypothesis for large samples	3	2	1
CO3	test hypothesis for small samples	3	2	1
CO4	solve transcendental, linear and non-linear system of equations using numerical methods	3	2	1
CO5	find the numerical solutions for first order initial value problems and integrals	3	2	1

UNIT- I

Probability, Random variables and Distributions: Random variables, Discrete random variable, Continuous random variable, Probability distribution function, Probability density function, Expectation, Moment generating function. Discrete distributions: Binomial and geometric distributions. Continuous distribution: Normal distributions.

UNIT – II

Sampling Theory: Introduction, Population and samples, Sampling distribution of means and variances
Test of Hypothesis For Large Samples : Introduction, Hypothesis, Null and Alternative Hypothesis, Type I and Type II errors, Level of significance, One tail and two-tail tests, Tests concerning one mean and proportion, two means-proportions and their differences- Point estimation, Maximum error of estimate, Interval estimation.

UNIT – III

Test of Hypothesis For small Samples: Tests concerning small samples- t– Test, F-Test and χ^2- Test and their properties, applications. Point estimation, Maximum error of estimate, Interval estimation.

UNIT-IV

Algebraic and transcendental Equations & Curve Fitting: Introduction, Bisection Method, Method of Flase position, Iteration methods: fixed point iteration and Newton Raphson methods. Solving linear system of equations by Gauss – Jacobi's, Gauss-Seidal Methods.
Curve Fitting: Fitting a linear, second degree, exponential, power curve by method of least squares.

UNIT-V

Numerical Integration and solution of Ordinary Differential equations: Trapezoidal rule-Simpson's $1/3^{rd}$ and $3/8^{th}$ rule-Solution of ordinary differential equations by Taylor's series, Picard's method of successive approximations, Euler's method, Runge-Kutta method (second and fourth order)

Text Books:

1. Probability and statistics for Engineers by Richard Arnold Johnson, Irwin Miller and Jhon E. Freund, New Delhi, Prentice Hall.
2. Probability and Statistics for Engineers and Sciences by Jay L. Devore, Cengage Learning.
3. Numerical Methods for Scientific and Engineering Computation by M. K. Jain, S.R.K. Iyengar and R. K. Jain, New Age International Publishers.

References:

1. Fundamentals Of Mathematical Statistics by S. C. Guptha & V. K. Kapoor, S.Chand.
2. Introductory Methods of Numerical Analysis by S.S. atry, PHI Learning Pvt. Ltd.
3. Mathematics for engineers and scientists by Alan Jeffrey,6^{th} edition, CRC press.

METALLURGY AND MATERIAL SCIENCE

II-B.Tech.-I-Sem. **L T P C**
Subject Code: 17ME2102ES **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	explain the concepts of structure of metals and constitution of alloys	3	2	1
CO2	construct and interpret equilibrium phase diagrams	3	2	1
CO3	analyze the material properties of ferrous and non-ferrous alloys	3	2	1
CO4	apply various heat treatment methods to steels	3	2	1
CO5	outline the properties, applications of ceramic and composite materials	3	2	1

UNIT – I

Structure of Metals :Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size.
Constitution of Alloys : Necessity of alloying, types of solid solutions,Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT -II

Equilibrium of Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cu-Sn and Fe-Fe_3C.

UNIT -III

Cast Irons and Steels :Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plan carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

UNIT – IV

Heat treatment of Alloys: Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.
Non-ferrous Metals and Alloys : Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

UNIT – V

Ceramic materials :Crystalline ceramics, glasses, cermaets, abrasive materials, nonomaterials – definition, properties and applications of the above.
Composite materials :Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites.

Text Books:

1. Introduction to Physical Metallurgy / Sidney H. Avener.
2. Material science & Metallurgy / Kodgire

Reference Books:

1. Science of Engineering Materials / Agarwal
2. Materials Science / Vijendra Singh
3. Elements of Material science / V. Rahghavan

MECHANICS OF SOLIDS

II-B.Tech.-I-Sem. **L T P C**
Subject Code: 17ME2103PC **3 1 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12	PO13
CO1	determine the stress and strain of various materials	3	3	2	2	3
CO2	sketch the shear force and bending moment diagrams for beams of various supports and loads	3	3	2	3	3
CO3	analyze flexural and shear stresses in a beam	3	3	3	2	3
CO4	evaluate principal stresses, strains and various theories of failure	3	3	3	3	3
CO5	determine stresses and deformations in shafts and thin cylinders	3	3	2	2	3

UNIT-I

SIMPLE STRESSES AND STRAINS : Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT-II

SHEAR FORCE AND BENDING MOMENT : Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilver, simply supported and overhanging beams subjected to point loads , u.d.l, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT-III

FLEXURAL STRESSES: Theory of simple bending – Assumptions Derivation of bending equation : M/I=f/y=E/R Neutral axis – Determination bending stresses – section modules of rectangular and circular sections (Solid and Hollow), I,T,Angle and Channel sections – Design of simple beam sections.
SHEAR STRESSES: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections.

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.
Theories of Failure: Introduction – Various theories of failure – Maximum Principal Stress Theory, Maximum Principal Strain Theory, Strain Energy and Shear Strain Energy Theory (Von Mises Theory).

UNIT - V

Torsion of Circular Shafts : Theory of pure torsion – Derivation of Torsion equations : $T/J = q/r = N\theta/L$ – Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure.
Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders– Thin spherical shells.

Text Books:

1. Strength of Materials by Andrew Pytel and Ferdinond L. Singer Longman
2. Strength of Materials by Jondar : Galgotia Publications

References:

1. Strength of Materials by Bansal, Lakshmi Publications
2. Strenght of Mateirals by S. Tumoshenko
3. Strength of Materials by R.S. Khurmi; S. Chand & Co. 2005

THERMODYNAMICS

II-B.Tech.-I-Sem. **L T P C**
Subject Code: 17ME2104BS **4 0 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12	PO14
CO1	explain various thermodynamic systems and processes	3	3	2	3
CO2	apply the basic laws of thermodynamics	3	3	2	3
CO3	evaluate the performance of energy conversion devices	3	3	2	3
CO4	find property values during process using mixture of gasses concepts	3	3	2	3
CO5	assess performance parameters of thermodynamic cycles	3	3	2	3

Tables/Codes: Steam Tables and Mollier Chart, Refrigeration Tables

UNIT – I

Introduction: Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Displacement & 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

UNIT – II

PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries – First law applied to a Process – applied to a flow system – Steady Flow Energy Equation.

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 specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics

UNIT – III

Pure Substances, p-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, 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.

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

UNIT – IV

Deviations from perfect Gas Model – Vader Waals Equation of State – Compressibility charts -

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 const. And Molecular Internal Energy, Enthalpy, sp. 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 - V

Power Cycles : Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.
Refrigeration Cycles: Bell-Coleman cycle, Vapour compression cycle- Performance Evaluation.

Text Books:

1. Engineering Thermodynamics / PK Nag /TMH, III Edition
2. Thermodynamics / C.P.Arora.

Reference Books:

1. Thermodynamics – An Engineering Approach – YunusCengel& Boles /TMH
2. Fundamentals of Classical Thermodynamics – G. Van Wylan& R.E. Sonntag – John Wiley Pub.
3. Thermodynamics – J.P.Holman / McGrawHill
4. Engineering Thermodynamics – Jones & Dugan
5. An introduction to Thermodynamics / YVC Rao / New Age
6. Thermodynamics & Heat Engines – Yadav – Central Book Depot, Allahabad.
7. Thermodynamics – Achutan – PHI.
8. Thermodynamics – G.C. Gupta – Pearson Publications.

KINEMATICS OF MACHINERY

II-B.Tech.-I-Sem. **L T P C**
Subject Code: 17ME2105PC **4 0 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	illustrate concepts of kinematics and mechanisms of machines	3	3	2	2
CO2	evaluate velocity and acceleration of simple mechanisms	3	3	3	2
CO3	explain working principle of various straight line mechanisms	3	3	2	2
CO4	develop cam profiles based on follower motion	3	3	3	2
CO5	solve problems related to gears and gear trains	3	3	3	3

UNIT – I

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

Mechanism and Machines – Mobility of Mechanisms : Grubler's criterion, classification ofmachines – kinematics chain – inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains, Mechanical Advantage.

UNIT – II

Kinematics: Velocity and acceleration – Motion of link in machine – Determination ofVelocity and acceleration – Graphical method – Application of relative velocity method. **Plane motion of body:** Instantaneous center of rotation- centrodes and axodes – Threecenters in line theorem – Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method.

Kliens construction - Coriolis acceleration - determination of Coriolis component of acceleration

Analysis of Mechanisms: Analysis of slider crank chain for displacement- velocity andacceleration of slider – Acceleration diagram for a given mechanism.

UNIT – III

Straight-line motion mechanisms: Exact and approximate copied and generated types –Peaucellier - Hart - Scott Russel – Grasshopper – Watt -Tchebicheff's and Robert Mechanism - Pantographs

Steering gears: Conditions for correct steering – Davis Steering gear, Ackerman's steeringgear.

Hooke's Joint: Single and double Hooke's joint –velocity ratio – application – problems.

UNIT – IV

Cams: Definitions of cam and followers – their uses – Types of followers and cams –Terminology – Types of follower motion - Uniform velocity, Simple harmonic motion and uniform acceleration and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

Analysis of motion of followers: Tangent cam with Roller follower – circular arc cam withstraight, concave and convex flanks.

UNIT – V

Higher pair: Friction wheels and toothed gears – types – law of gearing, condition forconstant velocity ratio for transmission of motion – velocity of sliding

Forms of teeth, cycloidal and involutes profiles – phenomena of interferences – Methods of interference. Condition for minimum number of teeth to avoid interference – expressions for arc of contact and path of contact of Pinion & Gear and Pinion & Rack Arrangements– Introduction to Helical – Bevel and worm gearing

Gear Trains: Introduction – Types – Simple – compound and reverted gear trains –Epicyclic gear train. Methods of finding train value or velocity ratio of Epicyclic gear trains. Selection of gear box - Differential gear for an automobile

Text Books:

1. Theory of Machines and Mechanisms/JOSEPH E. SHIGLEY/ Oxford
2. Theory of Machines / S.S.Rattan / Mc Graw Hill Publishers.

Reference Books:

1. Theory of Machines / Sadhu Singh / Pearson.
2. Theory of Machines / Thomas Bevan/CBS.

METALLURGY & MATERIAL SCINECE LAB

II-B.Tech.-I-Sem. **L T P C**
Subject Code: 17ME2106ES **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO5
CO1	interpret crystal structure and necessity of alloying	3	3	3
CO2	perform metallographic characterization of metals and metal alloys	3	3	3
CO3	plot the hardness variations of heat treated and non-heat treated steels	3	3	3
CO4	select materials for various engineering applications	3	3	3
CO5	apply the skills and modern techniques for latest materials	3	3	3

LAB EXPERIMENTS

1. Preparation and study of Crystal models.
2. Study of: Specimen cutting machine Specimen mounting press Grinding and polishing equipment
3. Study of microscope working principles.
4. Study of the Micro Structures of CastIrons.
5. Preparation and study of the Microstructure of Mild steels
6. Preparation and study of the Microstructure of low carbon steels
7. Preparation and study of the Microstructure of high Csteels
8. Study of the Micro Structures of Non-Ferrousalloys.
9. Hardeneabilityof steels by Jominy End QuenchTest.
10. To study heat treatment processes (hardening and tempering) of steel specimen.
11. To find out the hardness of various treated and untreatedsteels.

FUELS AND LUBRICANTS LAB

II-B.Tech.-I-Sem. **L T P C**
Subject Code: 17ME2107BS **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO5
CO1	determine flash and fire point of fuels	3	3	3
CO2	experiment with bomb calorimeter	3	3	3
CO3	determine viscosity of lubricants	3	3	3
CO4	evaluate the percentage of carbon residue in fuel sample	3	3	3
CO5	predict penetration depth using grease penetration test	3	3	3

LIST OF EXPERIMENTS

1. Determination of Flash and Fire points of Liquid fuels.
2. Determination of Flash and Fire points of Lubricants.
3. Carbon residue test: Liquid fuels.
4. Determination of Viscosity: Liquid lubricants.
5. Determination of Calorific value: Solidfuels.
6. Determination of Calorific value: Liquid fuels.
7. Determination of Calorific value: Gaseous fuels.
8. Greese penetration test.
9. Viscosity determination by Redwood methods.
10. Viscosity determination by Saybolt methods.
11. Bomb Gas Calorimeter.
12. Junkers Gas Calorimeter.

MECHANICS OF SOLIDS LAB

II-B.Tech.-I-Sem. **L T P C**
Subject Code: 17ME2108PC **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO13
CO1	analyze stress-strain relationship for given material	2	3	3
CO2	assess the flexural strength for given member	2	3	3
CO3	determine shear modulus of shaft and stiffness of spring	2	3	3
CO4	find the hardness and compressive strength of given material	2	3	3
CO5	measure toughness using Charpy and Izod tests	2	3	3

List of Experiments:

1. Direct tension test
2. Bending test on Simple supported beam
3 Bending test on Cantilever beam
4. Torsion test
5. Brinell hardness test
6. Rockwell hardness test
7. Test on springs
8. Compression test on cube
9. Izod Impact test
10 .Charpy Impact test
11. Punch shear test

ENVIRONMENTAL SCIENCE AND TECHNOLOGY
MANDATORY COURSE (NON-CREDIT)

II-B.Tech.-I-Sem. **L T P C**
Subject Code: 17HS2109MC **3 0 0 -**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO6	PO7	PO12
CO1	identify the role of ecosystem for livelihood	3	3	3	2
CO2	interpret methods to sustain environmental resources	3	3	3	2
CO3	outline bio-diversity and its relevance to ecological balance	3	3	3	2
CO4	explain laws and legislations on environmental protection	3	3	3	3
CO5	evaluate technologies for achieving sustainable development	3	3	3	2

UNIT I: Ecosystem
Introduction to ecosystem: Definition, Scope and Importance; Classification of ecosystem; Structure and functions of ecosystem food chain, food web, ecological energetic, eco-pyramids, carrying capacity); Biogeochemical cycles (Carbon and Nitrogen Cycles), flow of energy; Institutions (BNHS, BVIEER, ZSI, BSI) Environment movement in India (MedhaPatkar, SundarlalBahuguna, Indira Gandhi, Rachael Carson).
Biotic and abiotic components–Case studies of forest/aquatic/desert ecosystem.

UNIT II: Natural Resources
Renewable and Non–renewable resources–Importance, uses, classification of natural resources(i) forest: deforestation, timber extraction & conservation (ii) water: conflicts over water, dams –benefits &effects; use and over exploitation of water resources , floods, droughts (iii) mineral :use and exploitation, effects on mining, (iv) energy resources: growing needs, renewable and non renewable energy sources, use of alternative energy (v) land resources: land degradation, landslides, soil erosion and desertification; role of an individual in conservation of natural resources and equitable use.

UNIT III: Biodiversity
Definition and levels of biodiversity, Values of biodiversity Bio– geographical classification of India; hot spots of biodiversity; India as a mega diversity nation; Threats to biodiversity; Endangered and endemic species of India; Conservation of biodiversity: In–situ and Ex–situ conservation; Case studies on conservation of biodiversity. National biodiversity Act.

UNIT IV: Environmental Pollution & Control Technologies:
Types of environmental pollution; **Air pollution**: major air pollutants, sources ,effects, control measures , National Air Quality Standards. Water pollution :,sources,impacts & control technologies-STP, ETP,watershed management,rain water harvesting, Water Quality standards. Soil pollution: sources, causes & impacts on modern agriculture. Noise pollution. Solid waste Management- causes, effects and control measures; E-waste. Disaster management (floods and cyclones); **Global Environmental Issues and Treaties**: Global warming, ozone layer depletion. International protocol: earth summit, Kyoto protocol and Montreal protocol. Population Explosion

UNIT V: Environmental Acts , EIA & Sustainable Development :
Environment Protection Acts: Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act and Forest Conservation Act, Environment (Protection) Act, 1986. Handling rules of biomedical waste,municipal waste & hazardous waste. EIA: conceptual facts, base line data acquisition, EIS, EMP, Technology and Environmental Impact. **Sustainable development**-causes & threats, strategies for achieving sustainable development; Environmental Ethics and economics; CDM and concept of green building, life cycle assessment(LCA); Ecological foot print; low carbon life style; carbon sequestration; crazy consumerism; urban sprawl. **Role of Information Technology** in Environment- Remote Sensing, GIS, Environmental Modeling

Textbooks:

1. Erach Bharucha (2005), textbook of environmental studies for UG, Universities press, Hyderabad.
2. Environmental Science by Y. Anjaneyulu, B S Publications(2004)
3. Environmental studies by Rajagopalan R (2009), Oxford University Press, New Delhi.

References:

1. Environmental Science and Technology by M. Anji Reddy(2007), B.S Publications,
2. Perspectives in Environmental Science by Anubha Kaushik (2006), 3rd edition ,New age International Publications
3. Environmental Studies by Anubha Kaushik (2006), 4th edition ,New age International Publications

ANALYTICAL SKILLS
MANDATORY COURSE (NON-CREDIT)

II-B.Tech.-I-Sem. **L T P C**
Subject Code: 17BS2110MC **0 0 2 -**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO9	PO10
CO1	apply operations like searching, insertion, deletion, traversing mechanism etc. on various data structures	3	3
CO2	apply measurement techniques to data collection and utilize their innovative thinking skills to project themselves for finding fresh approaches towards tribulations	3	3
CO3	use the skills for effective communication	3	3
CO4	identify different types of arguments as well as their premises and conclusions	3	3
CO5	demonstrate the mathematical reasoning, including the ability to prove simple results and/or make statistical inferences	3	3

UNIT-I
Data Interpretation: Introduction to Data Interpretation, quantitative and qualitative data, Tabular Data, Line Graphs, Bar Chart, Pie Charts, X-Y Charts.

UNIT-II
Reasoning: Number Series, Letter Series, Series completion, Coding and Decoding,

UNIT-III
Verbal Analogy: Classifications, Word analogy-Applied analogy, verbal classification.

UNIT-IV
Reasoning Logical Diagrams: Simple Diagrammatic Relationship, Multi diagrammatic relationship, Venn-diagramms, Analytical reasoning.

UNIT-V
Reasoning Ability: Blood Relations, Seating arrangements, Directions, Decision making.

TEXT BOOKS:

1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials
2. R S Agarwal, S.Chand, 'A modern approach to Logical reasoning'
3. Verbal and non verbal Reasoning by S.Aggarwal
4. Analytical Reasoning by M.K.pandey

II-B.TECH.-II-SEMESTER SYLLABUS

MANUFACTURING PROCESS

II-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME2201PC **4 0 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12	PO14
CO1	explain concepts of various casting techniques	3	3	2	3
CO2	differentiate various welded joints	3	3	2	3
CO3	distinguish the process details of soldering, brazing and welding	3	3	3	3
CO4	illustrate various techniques of metal working	3	3	2	3
CO5	distinguish various extrusion and forging techniques	3	3	3	3

UNIT – I

Casting: Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of moulding sands.

Methods of Melting - Crucible melting and cupola operation – Defects in castings;

Casting processes – Types – Sand moulding (Airset, CO_2moulding), Centrifugal casting, die- casting, Investment casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design.

Solidification of casting – Solidification of pure metal – Nucleation and grain growth, casting design considerations

UNIT – II

Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding.

UNIT – III

Inert Gas 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

Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth.

Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements

Stamping, forming and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning.

Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – V

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

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.

Text Books:

1. Manufacturing Technology / P.N. Rao/TMH

Reference Books:

1. Production Technology / R.K. Jain
2. Metal Casting / T.V Ramana Rao / New Age

DYNAMICS OF MACHINES

II-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME2202PC **4 0 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	explain the concepts of Gyroscopes, static and dynamic force analysis	3	3	2	3
CO2	illustrate turning moment diagrams and design of fly wheels	3	3	2	3
CO3	outline the concepts of friction-clutches, brakes and dynamometers	3	3	2	3
CO4	analyze balancing of rotating masses and characterisctics of governors	3	3	2	3
CO5	summarize free and forced vibrations	3	3	2	3

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

Turning Moment Diagram And Flywheels: Engine Force Analysis – Piston Effort, Crank Effort, etc., Inertia Force in Reciprocating Engine – Graphical Method - Turning moment diagram – fluctuation of energy – flywheels and their design - Inertia of connecting rod- inertia force in reciprocating engines – crank effort and torque diagrams.-.

UNIT – III

Friction: pivots and collars – uniform pressure, uniform wear – friction circle and friction axis: lubricated surfaces – boundary friction – film lubrication. Clutches – Types – Single plate, multi-plate and cone clutches.

Brakes And Dynamometers: Types of brakes: Simple block brake, band and block brake-internal expanding shoe brake-effect of braking of a vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

UNIT – IV

Governors: Types of governors - Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung with auxiliary springs. Sensitiveness, isochronisms and hunting – stability – effort and power of the governors.

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 in-line 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 – 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.

Text Books:

1. Theory of Machines, S.S.Rattan.
2. Theory of Machines, R.S.Khurmi

Reference Books:

1. Theory of Machines, Shigley, Mc Graw Hill Publishers
2. Theory of Machines, Thomas Bevan, CBS Publishers
3. Theory of Machines, R.K.Bansal (Lakshmi publications)

FLUID MECHANICS & HYDRAULIC MACHINERY

II-B.Tech.-I-Sem. **L T P C**
Subject Code: 17ME2203PC **4 0 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	explain the concepts of fluid statics	3	3	2	2
CO2	describe the concepts of fluid kinematics and dynamics	3	3	3	3
CO3	analyze flow through different pipes and boundary layer theory	3	3	3	3
CO4	select suitable turbine for given heads	3	3	3	2
CO5	estimate performance parameters of hydraulic machines	3	3	3	3

UNIT I

Fluid Statics: Dimensions and Units: physical properties of fluids-specific gravity, viscosity, surface tension, capillarity- vapour pressure-atmospheric, gauge and vaccum pressure- measurement of pressure- piezometer, U-Tube and Differential Manometers.

UNIT II

Fluid kinematics: stream line, path line and steak line and stream line, classification of flows steady &un steady, uniform & non uniform, laminar & turbulent, rotational &irrotational flows-equation of continuity for one dimensional flow and three dimensional flow.

Fluid dynamics: Surface & body forces, Euler's &Bernouli's equations for flow along a stream line, moment equation and its applications on force on pipe bend. Measurement of flow: pitot tube, venture meter and orifice meter, flow nozzle.

UNIT III

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.

Boundary layer concepts: Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivations) boundary layer in transition, separation of boundary layers submerged objects-drag and lift .

UNIT IV

Basics and hydraulic turbine turbo machinery: Hydro dynamic force on jets on stationary and moving plate, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency , flow over radial vanes.

Classification of turbines, heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine, and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design-draft tube theory-functions and efficiency.

UNIT V

Performance of hydraulic turbines and pumps: Geometric similarity, unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbines, cavitation, surge tank, water hammer.

Centrifugal pumps: Classification, working, work done-barometric head-losses and efficiencies specific speed-performance characteristic curves, NPSH.

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

Text Books:

1. Fluid mechanics and hydraulic machines by R.K.Bansal.
2. Hydraulics, Fluid mechanics and hydraulic machinery by MODI and SETH.

References:

1. Fluid mechanics and fluid power engineering by D.S.Kunar, Kotaria and sons.
2. Fluid mechanics and machinery by D. Rama Durgaiah, New age international.
3. Hydraulic machines by Banga and Sharma, Khanna publishers.

MACHINE DRAWING PRACTICE

II-B.Tech - II-Sem. **L T P C**
Subject Code: 17ME2204PC **1 0 3 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO6	PO10	PO13	PO14
CO1	apply the principles of engineering drawing in machine drawing	3	3	3	3	3	3
CO2	make use of conventional representation of materials and machine components	3	3	3	3	3	3
CO3	illustrate various permanent and temporary Fasteners, Joints and Couplings	3	3	3	3	3	3
CO4	develop assembly drawings from the given part drawing and vice versa	3	3	3	3	3	3
CO5	construct computer aided drawings using CAD software package	3	3	3	3	3	3

1.

Question Paper Pattern: Question paper has two parts. Part one has five questions out of which answer three (each 10 marks). Part two has one question (assembly with three views) and it is to be answered compulsorily (it carries 50 marks)

1. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
2. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
3. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
4. Title boxes, their size, location and details - common abbreviations and their liberal usage
5. Types of Drawings – working drawings for machine parts.

Drawing of Machine Elements and simple parts: Selection of Views, additional views for the following machine elements and parts with every drawing proportions.

6. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
7. Keys, cottered joints and knuckle joint.
8. Riveted joints for plates
9. Shaft coupling, spigot and socket pipe joint.
10. Journal, pivot and collar and foot step bearings.

Assembly Drawings: Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

11. Steam engine parts – stuffing boxes, cross heads, Eccentrics.
12. Machine tool parts: Tail stock, Tool Post, Machine Vices.
13. Other machine parts - Screws jacks, Petrol engine connecting rod, Plummer block
14. Simple designs of steam stop valve, spring loaded safety valve, feed check valve and air cock.

Note: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

Text Book:
1. Machine drawing –K.L.Narayana/ Wiley Eastern.

Reference Books:
1. Machine Drawing – P.S.Gill.
2. Machine Drawing – Junnarkar N.D. / Pearson Edu.
3. Machine Drawing – Bhattacharya, Oxford University Press
4. Machine Drawing – N.D.Bhatt / Charotar.

FINANCIAL ANALYSIS, MANAGEMENT & ECONOMICS

II-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME2205HS **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO11	PO12
CO1	analyze financial performance of an enterprise using final accounts and ratio	3	2
CO2	apply principles of management in professional career	3	2
CO3	make use of principles of economics for decision making	3	2
CO4	identify business environment and laws of demand	2	3
CO5	solve problems in the areas of production, cost, price and markets	3	3

UNIT - I

Introduction to Financial Statement Analysis: Types & Objectives of Business Enterprises, Conventional & Non Conventional Sources of Financing Business Enterprise.
Identification of Financial Statement Formats-Manufacturing A/c, Trading A/c, Profit & Loss A/c, Balance Sheet. Techniques of Analysing Financial Statements: Analysis & Interpretation through Liquidity, Leverage, Coverage, Activity, Turnover, Profitability Ratios-Simple Problems on Liquidity, Leverage and Activity Ratios.

UNIT - II

Introduction of Management Concepts: Concept, Origin, Growth, Nature, Characteristics, Scope and Principles of Management. Functions of Management: Planning, Organising, Staffing, Directing, Coordinating, Reporting and Budgeting. Scientific Management- FW Taylor Contributions to Management. Modern Management- Henry Fayol Contributions to Management.
Human Relations Approach to Management: Theories of Motivation and Leadership

UNIT - III

Functional areas of Management: Production Management: Systems of Production, PPC functions & Plant Layout. Financial Management: Objectives, Goals, & Functions of Financial Management.
Marketing Management: Recent Trends in Marketing & Marketing Mix.
Human Resources Management: Nature, Objectives, Scope & Functions of HR Management.

UNIT - IV

Introduction to Managerial Economics & Business Environment: Definition, Nature, Scope and Functions Managerial Economics, Difference between Micro & Macro Economics- Internal & External Scanning of Business Environment, Importance of National Income, Inflation, Deflation, Stagflation, Business Cycle & Product Life Cycle Concepts. Concept & Law of Demand, Factors Influencing and Limitations. Concept of Elasticity of Demand, Types of Elasticity, Methods of Measuring Elasticity. Introduction to Demand Forecasting, Objectives, Scope, Types and Methods.

UNIT –V

Theory of Production, Cost, Price & Markets: Production Function, Assumptions, Limitations & Types. Cost Concepts, Cost-Output Relationship, Break Even Analysis Assumptions, Limitations & Applications(Simple Problems). Theory of Pricing, Objectives, Situations & Types.
Introductions Markets, Demand-Supply Schedule for Equilibrium Price, Nature & Types of Competition.

Note: Student also expected to attempt following projects as a part of assignment

Project-1: Submission of a report on Recent Economic Policy Reforms in view of demonetization, IT & GST

Project-2: Submission of a report on financial performance of any listed public limited company either through its website or through website of nse.org or bse.org

Project-3: Submission of a report by visiting any organization to observe how management functions are carried out.

Text Books:

1. Varshney, Maheswari (2003), Managerial Economics, Sultan Chand, New Delhi, India.
2. Stoner, Freeman, Gilbert, Management, 6th Ed, Pearson Education, New Delhi, 2004.

Reference Books:

1. Kotler Philip & Keller Kevin Lane: Marketing Mangement 12/e, PHI, 2005
2. Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2005
   Thomas N.Duening & John M.Ivancevich Management—Principles and Guidelines, Biztantra, 2003.
3. Ambrish Gupta (2004), Financial Accounting for Management, Pearson Education, New Delhi, India.
4. Domnick Salvatore (2011), Managerial Economics in a Global Economy, 7th edition, Oxford University Press, United States of America.
5. Narayanaswamy (2005), Financial Accounting, A Managerial Perspective, Prentice Hall of India private Ltd, New Delhi, India.
6. Aryasri (2005), Managerial Economics and Financial Analysis, 2nd edition, Tata McGraw Hill, New Delhi, India

MANUFACTURING PROCESSES LAB

II-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME2206PC **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO14
CO1	perform the casting process in manufacturing of different types products	3	3	3
CO2	determine the properties of different types of moulding sands	3	3	3
CO3	illustrate different welding processes required for fabrication	3	3	3
CO4	test the various metal forming processes	3	3	3
CO5	make use of blow and injection moulding equipment	3	3	3

List of Experiments: (Minimum of 10 Exercises need to be performed)

I. METAL CASTINGLAB

1. Pattern Design and making - for one castingdrawing.
2. Sand properties testing - Exercise -for strengths, and permeability –1
3. Moulding Melting and Casting - 1Exercise

II. WELDINGLAB

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

III. MECHANICAL PRESSWORKING

1. Blanking & Piercing operation and study of simple, compound and progressive presstool.
2. Hydraulic Press: Deep drawing and extrusionoperation.
3. Bending and otheroperations

IV. PROCESSING OFPLASTICS

1. InjectionMoulding
2. Blow Moulding

KINEMATICS AND DYNAMICS LAB

II-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME2207PC **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO13
CO1	estimate primary & secondary forces for dynamic balancing of rotary masses	3	3	3
CO2	analyse the response of different vibrating systems	3	3	3
CO3	test the performance of governors	3	3	3
CO4	determine the effect of gyroscope for different motions	3	3	3
CO5	analyze cam profile	3	3	3

List of Experiments: (A Minimum of 10 experiments is to be conducted)

1. To determine the state of balance of machines for primary and secondary forces
2. To determine the frequency of torsional vibration of a given rod
3. Determine the effect of varying mass on the centre of sleeve in porter and proell governor
4. Find the motion of the follower if the given profile of the cam
5. The balance masses statically and dynamically for single rotating mass systems
6. Determine the critical speed of a given shaft for different n-conditions
7. For a simple pendulum determine time period and its natural frequency
8. For a compound pendulum determine time period and its natural frequency
9. Determine the effect of gyroscope for different motions
10. Determine time period, amplitude and frequency of undamped free longitudinal vibration of single degree spring mass systems.
11. Determine the pressure distribution of lubricating oil at various load and speed of a Journal bearing.
12. Determine time period, amplitude and frequency of damped free longitudinal vibration of single degree spring mass systems

FLUID MECHANICS & HYDRAULIC MACHINERY LAB

II-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME2208PC **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO14
CO1	find co-efficient of discharge for the venturimeter and orifice meter	2	3	2
CO2	determine minor losses and friction factor for a given pipeline	2	3	2
CO3	verify Bernoulli's equation	2	3	2
CO4	calculate impact of force of Jet on different types of Vanes	2	3	2
CO5	analyze the performance of various turbines and pumps	2	3	2

LIST OF EXPERIMENTS:

1. Verify Berboulli'sTheorm.
2. Calibration ofVenturimeter.
3. Calibration of Orificemeter.
4. Determination of friction factor for a given pipeline.
5. Determination of loss of head due to sudden contraction in apipeline.
6. Impact of Jets.
7. Performance Test on PeltonWheel.
8. Performance Test on FrancisTurbine.
9. Performance Test on KaplanTurbine.
10. Performance Test on Single Stage CentrifugalPump.
11. Performance Test on Multi Stage CentrifugalPump.
12. Performance Test on ReciprocatingPump.

GENDER SENSITIZATION LAB
MANDATORY COURSE (NON-CREDIT)

II-B.Tech.-II-Sem. **L T P C**
Subject Code: 17HS2209MC **0 0 2 -**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO9	PO12
CO1	identify gender issues in contemporary India	2	3
CO2	explain gender roles, spectrum, relationships etc	3	2
CO3	analyze gender issues related to sexual harassment and violence	3	3
CO4	assess gender and human rights	3	3
CO5	adapt to the societal need to end prejudices and achieve gender equality	2	3

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 tiler. Love and Acid just do not Mix. Love Letters. Mothers 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 or Many? Struggles with Discrimination. Additional Reading: Our Bodies, Our Health (Towards a World of Equals:Unit -13)

Unit - III
GENDER AND LABOUR: Housework: 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) Fact and Fiction. Unrecognized and Unaccounted work. Further Reading: Wages and Conditions of Work.

Unit - IV
ISSUES OF VIOLENCE: Sexual Harassment: Say Nol (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 o 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.

References:

1. Agnes. Flavia. My Story … Our Story of Re-building Broken Lives. Delhi: Forum Against Oppression of Woment (FAOW), 1988. 2nd Edition. Print
2. Brady. Judy 'I want a wife,' Literature for Composition: Essays. Faction, Poetry and Drama. Ed. Sylvan Barnet. Morton Berman. Willam Burto and Marcia Stubbs. 3rd Edition. New York:

HarperCollins Customs Books, 1971. Available online at: http://www.columbia. Edu/~sss31/rainbow/wife.html.Web.
3. NCERT History Textbook for Class IX. Ch 8: Clothing .
4. Roy, Rahul.A Little Book on Men. New Delhi: Yoda Books, 2007
5. Sen. Amartya. " More than One Million Women are Missing." New Yark Review of Books 37.20 (20 December 1990) . Print
6. Vimala. " Vantillu (The Kitchen). Women Writing in India: 600 BC to the Present. Volume II: The 20th Century. Ed. Susie Thanru and K Lalita. Delhi: Oxford University Press. 1995. 599-601. Print.
7. Sen, Arnartya. '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 Struggle. New Delhi: Kali for Women, 1989.
8. Tripti Lahiri. "By the Numbers: Where Indian Women Work." Women's Studies Journal (14 November 2012) Available online at: http:// blogs.wsj.com/ India real time/2012111/14/by - the numbers-where-Indian-women-work/>
9. K. Satyanarayana and Susie Tharu (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada http://harpercollins.co.in/BookDetail.aso?Book Code=3732

VERBAL ABILITY
MANDATORY COURSE (NON-CREDIT)

II-B.Tech.-II-Sem. **L T P C**
Subject Code: 17HS2210MC **0 0 2 -**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO9	PO10
CO1	recall grammatical and basic sentence structures for communication	3	3
CO2	list out various vocabulary forms and improve verbal ability	3	3
CO3	use sentence structures without errors	3	3
CO4	apply the sentence structure for effective paraphrasing	3	3
CO5	demonstrate effective verbal skills	3	3

UNIT I
Grammar Fundamentals
Basic Sentence Structure
Parts of Speech

- The Noun
- The Adjective
- Articles
- Pronouns
- The Verb
- The Adverb
- The Preposition
- The Conjunction
- The Interjection

UNIT II
Synonyms and Antonyms, Homonyms and Homophones, Word Formation, Idioms and Phrases, Analogy. One-word Substitutes.

UNIT III
Integrated Grammar Exercises on Common Errors, Vocabulary Enhancement, Using a dictionary

UNIT IV
Paragraph writing, Essay writing, Letter Writing, E-mail Writing, Picture Description

UNIT V
Sentence Equivalence, Text Completion, Comparison and Parallelism

Activities
1. Regular practice tests.
2. Quiz, Crossword, Word-search and related activities.
3. Picture Description including Description of Photos / Images / Posters / Advertisement Analysis etc.,

Text Books
1. Contemporary English Grammar Structure and Compositionby David Green.
2. Text for Communication Skills – Current English for Colleges by N Krishnaswamy and T.Sriram..

References
1. The Oxford English Grammar by Sidney Greenbaum.
2. English Skills for Technical Studentsby Amaresh Mukherjee, Sankarnath Ghosh and Prabir Ghosh, Orient Longman Pvt Ltd.

III-B.TECH.-I-SEMESTER SYLLABUS

THERMAL ENGINEERING – I

III-B.Tech-I-Sem **L T P C**
Subject Code: 17ME3101PC **4 0 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO6	PO12	PO14
CO1	explain functioning of various IC engines	3	3	2	3
CO2	distinguish normal and abnormal combustion phenomena in IC Engines	3	3	2	3
CO3	express the effect of various operating variables on engine performance	3	3	2	3
CO4	demonstrate functioning of reciprocating, rotary and dynamic compressors	3	3	2	3
CO5	analyze functioning of axial flow compressors	3	3	2	3

Unit – I

I.C. Engines: Classification - Working principles of Four & Two stroke engine, SI & CI engines, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems – Carburetor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition, Cooling and Lubrication system, Fuel properties and Combustion Stoichiometry.

Unit – II

Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effect of engine variables – Abnormal combustion, pre-ignition and knocking in SI Engines – Fuel requirements and fuel rating, anti knock additives – combustion chamber – requirements, types of SI engines.

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

Unit- III

Testing and Performance: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart

Classification of compressors – Fans, blowers and compressors – positive displacement and dynamic types – reciprocating and rotary types

Reciprocating Compressors: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance volume, staged compression, under cooling, saving of work, minimum work condition for staged compression

Unit – IV

Rotary Compressor (Positive displacement type): Roots Blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.

Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power.

Unit – V

Axial Flow Compressors: Mechanical details and principle of operation – velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations – Polytropic efficiency.

Text Books:

1. I.C. Engines / V. Ganesan- TMH
2. Thermal Engineering / Rajput / Lakshmi Publications.
3. Thermal Engineering / P.K.Nag

Reference Books:

1. IC Engines – Mathur & Sharma – Dhanpath Rai & Sons.
2. Engineering fundamentals of IC Engines – Pulkrabek / Pearson /PHI
3. Thermal Engineering / Rudramoorthy - TMH
4. Thermodynamics & Heat Engines / B. Yadav/ Central Book Depot., Allahabad
5. I.C. Engines / Heywood /McGrawHIll.
6. Thermal Engineering – R.S. Khurmi & J.K.Gupta – S.Chand

DESIGN OF MACHINE ELEMENTS – I

B.Tech. III Year I Sem **L T P C**
Subject Code: 17ME3102PC **3 1 0 3**

Note: Design Data books are not permitted in the Examinations. The design must not only satisfy strength criteria but also rigidity criteria.

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO8	PO12	PO13
CO1	explain the design procedure and select materials for specific application	3	3	2	2	3
CO2	evaluate the strength, stiffness and fatigue of machine elements	3	3	2	2	3
CO3	design riveted, welded and bolted joints	3	3	3	2	3
CO4	design keys, cotters, knuckle joints	3	3	3	2	3
CO5	design shafts and couplings	3	3	3	2	3

Unit – I
Introduction: General considerations in the design of Engineering Materials and their properties – selection –Manufacturing consideration in design.
Design for Static Strength: Simple stresses – Combined stresses – Torsional and Bending stresses – Impact stresses – Stress strain relation – Theories of failure – Factor of safety – Design for strength and rigidity – preferred numbers.

Unit – II
Design for Fatigue Strength: Stress concentration–Theoretical stress Concentration factor – Fatigue stress concentration factor- Notch Sensitivity. Design for fluctuating stresses – S-N Diagram - Endurance limit – Estimation of Endurance strength – Gerber's curve – Goodman Method– Soderberg Method.

Unit – III
Riveted, Welded and Bolted Joints:
Riveted joints- methods of failure of riveted joints - strength equations - efficiency of riveted joints, eccentrically loaded riveted joints.
Welded joints-Design of fillet welds-axial loads-circular fillet welds under bending, torsion. Welded joints under eccentric loading
Bolted joints – Types of Bolts - Design of bolts with pre-stresses – Design of Bolted joints under eccentric loading – bolts of uniform strength

Unit – IV
Keys, Cotters and Knuckle Joints: Types of keys - Design of keys - stresses in keys-cottered joints - spigot and socket, sleeve and cotter, jib and cotter joints, Knuckle joints.

Unit – V
Shafts: Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads – Shaft sizes – BIS code.
Shaft Couplings: Rigid couplings – Muff, Split muff and Flange coupling, Flexible coupling– Bushed-Pin Coupling.

Text Books:
1. Design of Machine Elements / V.B. Bhandari / Mc Graw Hill
2. Machine Design / Jindal / Pearson

Reference Books:
1. Design of Machine Elements / V. M. Faires / Macmillan
2. Design of Machine Elements-I / Annaiah, M.H / New Age
3. Mechanical Engineering Design / Richard G. Budyanas and J. keith Nisbett / Shygley

REFRIGERATION & AIR-CONDITIONING

III-B.Tech.-I-Sem **L T P C**
Subject Code: 17ME3103PC **4 0 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO7	PO12	PO14
CO1	apply the concepts of refrigeration to various systems	3	3	2	2	3
CO2	analyze the performance of vapor compression systems	3	3	2	2	3
CO3	illustrate the components of refrigeration system	3	3	2	2	3
CO4	outline vapor absorption, steam jet refrigeration systems	3	3	2	2	3
CO5	determine cooling and heating loads in air conditioning systems	3	3	2	2	3

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 crafts- Air systems – Actual Air refrigeration system – Refrigeration needs of Air crafts – Application of Air Refrigeration, Justification – 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

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. A Course in Refrigeration and Air conditioning / SC Arora & Domkundwar / Dhanpatrai
2. Refrigeration and Air Conditioning/ Manohar Prasad/ New Age

Reference Books:

1. Refrigeration and Air Conditioning / CP Arora / TMH.
2. Principles of Refrigeration - Dossat / Pearson Education
3. Basic Refrigeration and Air-Conditioning – Ananthanarayanan / TMH

MACHINE TOOLS AND METROLOGY

III-B.Tech.-I-Sem **L T P C**
Subject Code: 17ME3104PC **4 0 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12	PO14
CO1	explain cutting tool geometry, types of lathes and chip formation	3	3	3	2	3
CO2	illustrate operations of drilling, and boring machines	3	3	2	2	3
CO3	make use of the operations of milling and grinding machines	3	3	2	2	3
CO4	analyze the limits and tolerances for engineering components	3	3	3	2	3
CO5	test surface roughness of part and tool alignment	3	3	3	2	3

Unit – I

Metal cutting: Introduction, elements of cutting process – Geometry of single point tools. Chip formation and types of chips. Engine lathe – Principle of working, types of lathe, specifications. Taper turning,– Lathe attachments. Capstan and Turret lathe – Single spindle and multi-spindle automatic lathes – tool layouts

Unit – II

Shaping, slotting and planning machines –Principles of working – machining time calculations. Drilling and Boring Machines – Principles of working, specifications, types, and operations performed; twist drill. Types of Boring machines and applications

Unit – III

Milling machines – Principles of working – Types of milling machines – Geometry of milling cutters methods of indexing.

Grinding – theory of grinding – classification of grinding machines - Types of abrasives, bonds Selection of a grinding wheel

Lapping, honing and broaching machines, comparison and Constructional features, machining time calculations

Unit – IV

Limits, fits and tolerances- Unilateral and bilateral tolerance system, hole and shaft basis system. Interchangeability and selective assembly - Limit Gauges: Taylor's principle, Design of GO and NO GO gauges Measurement of angles, Bevel protractor, and Sine bar. Measurement of flat surfaces, straight edges, surface plates, optical flat and auto collimator

Unit – V

Surface Roughness Measurement: Roughness, Waviness. CLA, RMS, Rz Values. Methods of measurement of surface finish, Talysurf.

Screw thread measurement, Gear measurement; Machine Tool Alignment Tests on lathe, milling and drilling machines - Coordinate Measuring Machines: Types and Applications of CMM

Text Books:

1. Machine Tool Practices/ Kibbe, Johne. Neely, T. White, Rolando O. Meyer/ Pearson
2. Fundamentals of Metal Machining and Machine Tools / Geoffrey Boothroyd / McGraw Hill.

Reference Books:

1. Principles of Machine Tools, Bhattacharyya A and Sen.G.C / New Central Book Agency.
2. Fundamentals of Dimensional Metrology / Connie Dotson / Thomson

DISASTER MANAGEMENT
(Open Elective - I)

III-B.Tech.-I-Sem **L T P C**
Subject Code: 17CE3105OE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO7	PO8	PO12
CO1	analyze impact of disasters	3	2	3	3
CO2	choose suitable disaster management mechanism	3	3	3	3
CO3	make use of appropriate measures for capacity building to reduce risks	2	2	3	2
CO4	develop strategies to cope up with disasters	3	3	3	3
CO5	build disaster management plan	2	3	3	3

Unit - I

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters - Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches

Unit - II

Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man indeced hazards & Disasters - Natural Hazards - Planetary Hazards / Disasters - Extra Planetary Hazards / disasters - Planetary Hazards - Endongenous Hazards - Exogenous
Hazards

Unit - III

Endogenous Hazards: Volcanic eruption - Earthquakes - landslides - Volcanic Hazards / Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions
Environmental impacts of volcanic eruptions - Earthquake Hazards / disasters - Causes of
Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - Human adjusment, perception & mitigation of earthquake.

Unit - IV

Exogenous hazards / disasters - Infrequent events - Cumulative atmospheric hazards / disasters
Infrequent events: Cyclones - Lightning - Hailstorms
Cyclones: Tropical cyclones & Local stroms - Destruction by tropical cyclones & local stroms (causes, distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/ disasters :- Floods - Droughts - Cold waves - Heal waves
Floods: Causes of floods - Flood hazards India - Flood control measures (Human adjustment, perception & mitigation)
Droughts: - Impacts of droughts - Drought hazards in India - Drought control measures - Extra Planetary Hazards / Disasters - man induced Hazards / Disasters - Physical hazards / Disasters - Soil erosion
Soil Erosion: Mechanics & forms of Soil Erosion - Factors 7 causes of Soil Erosion - Conservation measures of Soil Erosion.
Chemical hazards / disasters: Release of toxic chemicals, nuclear explosion - Sedimentation processes Sedimentation processes: Global Sedimentation problems - Regional Sedimentation problems - Sedimentation & Environmental problems - Corrective measures of Erosion & Sedimentation
Biological hazards / disasters: Population Explosion.

Unit - V:

Emerging approaches in Disaster Management - Three stages
1. Pre-disaster Stage (preparedness)
2. Emergency Stage
3. Post Disaster stage - Rehabilitation

Text Books:

1. Disaster Mitigation: Experiences And Reflections by Pradeep Sahni
2. Natural Hazards & Disasters by Donald Hyndman & David Hyndman - Cengage Learning

References:

1. R. B. Singh (Ed) Environmental Geography, Heritage Publishers New Delhi, 1990
2. Savinder Singh Environmental Geography, Prayag Pustak Bhawann 1997
3. Kates, B. I & White, G. F The Environment as Hazards, oxford, New York, 1978
4. R. B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000
5. H. K. Gupta (Ed) Disaster Management, Universities Press, India, 2003
6. R. B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo, 1994
7. Dr. Satender, Disaster Management in Hills, Concept Publishing Co., New Delhi, 2003
8. S. Arya Action Plan For Earthquake, Disaster, Mitigation in V. K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994
9. R. K. Bhandani An overview on Natural & Man made Disaster & their Reduction, CSIR, New Delhi
10. M. C. Gupta Manuals on Natural Disaster Management in india, National Centre for Disaster Management, IIPA, New Delhi, 2001.

OPERATIONS RESEARCH
(Open Elective - I)

III-B.Tech.-I-Sem **L T P C**
Subject Code: 17ME3105OE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	formulate and solve linear programming problem using various methods	3	2	3
CO2	solve transportation and assignment problems	3	3	3
CO3	compute sequencing and inventory model problems	2	2	3
CO4	analyze waiting lines and game theory problems	3	3	3
CO5	evaluate replacement and dynamic programming problems	2	3	3

Unit-I

Introduction to Operations Research: Basics definition, scope, objectives, phases, models, applications and limitations of Operations Research.

Allocation: Linear Programming Problem Formulation, Graphical solution, Simplex method, Artificial variables techniques: Two-phase method, Big M method.

Unit-II

Transportation Problem: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: MODI method.

Assignment model: Formulation. Hungarian method for optimal solution - Solving unbalanced problem - Traveling salesman problem and assignment problem

Unit—III

Sequencing: Introduction, Flow-Shop sequencing, n jobs through two machines, n jobs through three machines, Job shop sequencing, two jobs through m machines.

Inventory: Introduction, Single item, Deterministic models - Purchase inventory models with one price break and multiple price breaks -Stochastic models - demand may be discrete variable or continuous variable - Single Period model and no setup cost.

Unit—IV

Theory of Games: Introduction, Terminology- Solution of games with saddle points and without saddle points- 2 x 2 games, dominance principle, m x 2 & 2 x n games -graphical method.

Waiting Lines: Introduction, Terminology-Single Channel-Poisson arrivals and Exponential Service times-with infinite population and finite population models-Multichannel-Poisson arrivals and exponential service times with infinite population.

Unit—V

Replacement: Introduction, Replacement of items that deteriorate with time, when money value is not counted and counted - Replacement of items that fail completely- Group Replacement.

Dynamic Programming: Introduction, Terminology- Bellman's Principle of Optimality- Applications of dynamic programming- Project network – CPM and PERT networks – Critical path scheduling.

Text Books

1. Operations Research /J.K.Sharma 4e. /MacMilan.
2. Introduction to O.RIHilIier & LibermannfTMH.

Reference Books

1. Introduction to O.R /TahaIPHl.
2. Operations Research! NVS Raju/ SMS Education/3d Revised Edition.
3. Operations Research /A.M.Natarajan, P,Balasubramaniam, A Tamilarasi/Pearson Education.
4. Operations Research I Wagner! PHI Publications.

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(Open Elective-I)

III Year B.Tech I-Sem **L T P C**
Subject Code: 17EC3105OE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	apply the fundamental concepts of measuring instruments	3	2	2
CO2	distinguish signal generators and signal analyzers	3	3	2
CO3	make use of oscilloscopes	3	2	2
CO4	identify various transducers	3	3	2
CO5	develop bridges for various measuring parameters	3	2	2

Unit I

Block Schematics of Measurement: Performance characteristics, Static characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; 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

Unit II

Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators, Sweep Frequency Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square
Wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

Unit III

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines.Applications:Measurement of Time, Period and Frequency Specifications. **Special Purpose Oscilloscopes**: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

Unit IV

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, Variable Capacitance Transducers, Magneto Strictive Transducers.

Unit V

Bridges: Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge. **Measurement of Physical Parameters:** Flow Measurement, Displacement Meters, level of Measurement, Measurement of Humidity and Moisture, Force, Pressure-High pressure, Vacuum level, Temperature Measurements, Data Acquisition Systems.

Text Books:

1. Electronic Instrumentation: H.S.Kalsi-TMH 2nd Edition 2004
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D.Cooper: PHI 5th Edition **2003**

Reference Books:

1. Electronic Instrumentation and Measurements- David A. Bell, Oxford Univ.Press, 1997.
2. Electronic Measurements and Instrumentation: B.M. Oliver, J.M.Cage TMH Reprint 2009.
3. Electronic Measurements and Instrumentation K.Lal Kishore, Pearson Education 2010.

JAVA PROGRAMMING
(Open Elective-I)

III-B.Tech.-I-Sem **L T P C**
Subject Code: 17CS3105OE **3 0 0 3**

Prerequisites: A basic idea of "Computer Programming & Data Structures"

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO5	PO12
CO1	write simple java programs using OOP concepts	3	2	2	3	2
CO2	develop programs using inheritance and polymorphism	3	2	3	3	2
CO3	build efficient code using multithreading and exception handling	3	2	3	3	2
CO4	illustrate event handling mechanism	3	2	3	3	2
CO5	make use if applets and swing concepts	3	2	3	3	2

Unit I:
Object-oriented thinking and Java Basics
Object-oriented thinking- Need for OOP paradigm, summary of OOP concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods
Java Basics-History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java programs, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, exploring String class.

Unit II:
Inheritance, Polymorphism, Packages and Interfaces
Inheritance- Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination. Benefits of inheritance, costs of inheritance - Member access rules, super uses, using final with inheritance, the Object class and its methods
Polymorphism- method overriding, dynamic binding, abstract classes and methods
Packages- Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages. Exploring java.io
Interfaces- Differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

Unit III: Exception handling and Multithreading
Exception handling- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

Multithreading- Differences between multi threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, daemon threads - Enumerations, auto boxing, annotations, generics. Exploring java.util

Unit IV:
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, nested and inner classes. The AWT class hierarchy, user interface components- labels, buttons, canvas, scrollbars, text components, checkbox, checkbox groups, choices, lists panels – scrollpane, dialogs, menubar, graphics, Layout Managers- Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.

UNIT V:
Applets and Swings
Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Swings – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, ImageIcon, JLabel, JTextfield, JButton, JCheckbox, JList, JRadiobutton, JComboBox, JTabbedPane, JScrollPane, JTree and JTable.

Text Books:

1. Java the complete reference, 8th editon, Herbert Schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Eduction.

References:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley & sons
2. Java How to Program, H.M.Dietel and P.J.Dietel, Sixth Edition, Pearson Education/PHI.
3. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
4. An introduction to Java programming and object oriented application development, Richard A. Johnson.

THERMAL ENGINEERING LAB

III-B.Tech-I-Sem **L T P C**
Subject Code: 17ME3106PC **0 0 3 2**

Pre-Requisite: Thermodynamics

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO7	PO14
CO1	construct valve timing diagram and test the performance of IC engines	3	3	3	3
CO2	find engine frictional power by motoring, retardation and Morse tests	3	3	3	3
CO3	determine volumetric efficiency of IC engines	3	3	3	3
CO4	estimate the efficiency of reciprocating air compressor	3	3	3	3
CO5	study on boilers and identify the parts of the engine by disassembly	3	3	3	3

LIST OF EXPERIMENTS: (A Minimum of 10 experiments are to be conducted)

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 at constant speed
10. Performance Test on Reciprocating Air – Compressor Unit
11. Dis-assembly / Assembly of Engines
12. Study of Boilers

MACHINE TOOLS LAB

III-B.Tech.-I-Sem **L T P C**
Course Code: 17ME3107PC **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO6	PO14
CO1	perform various operations on lathe and drilling machines	3	3	3	3
CO2	develop simple features by using shaper, planer and milling machines	3	3	3	3
CO3	measure the bores by internal micrometers and dial bore indicators	3	3	3	3
CO4	determine the angle and taper using Bevel protractor and Sine bar	3	3	3	3
CO5	evaluate screw thread parameters	3	3	3	3

Course Outcomes: Upon completion of the course, the student will be able to

1. perform step turning, taper turning, thread cutting, drilling and tapping operations on lathe
2. develop simple features by performing operations on shaper, planer and milling machines
3. measure the bores by internal micrometers and dial bore indicators
4. determine the angle and taper using Bevel protractor and Sine bar
5. evaluate screw thread parameters

List of Experiments:

1. Introduction of general purpose machines -Lathe, Drilling machine, Milling machine, Shaper,
2. Planing machine, slotting machine, Cylindrical Grinder, surface grinder and tool and cutter grinder.
3. Step turning and taper turning on lathe machine
4. Thread cutting and knurling on -lathe machine.
5. Drilling and Tapping
6. Shaping and Planning
7. Slotting
8. Milling
9. Cylindrical Surface Grinding
10. Grinding of Tool angles.

ADVANCED ENGLISH COMMUNICATION SKILLS (AECS) LAB

III-B.Tech-I-Sem **L T P C**
Subject Code: 17ME3108HS **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO5	PO10
CO1	assess and utilize vocabulary in an effective way	3	3
CO2	interpret interpersonal relationships	3	3
CO3	elaborate academic reading and writing skills	3	3
CO4	formulate appropriate communication techniques in various contexts	3	3
CO5	adapt to different work-place and socio-cultural scenarios	3	3

1. **Inter-personal Communication and Building Vocabulary** - Starting a Conversation– Responding appropriately and Relevantly – Using Appropriate Body Language – Role Play in Different Situations - Synonyms and Antonyms, One-word Substitutes, Prefixes and Suffixes, Idioms and Phrases and Collocations.
2. **Reading Comprehension** –General Vs Local Comprehension, Reading for Facts, Guessing Meanings from Context, , Skimming, Scanning, Inferring Meaning.
3. **Writing Skills** – Structure and Presentation of Different Types of Writing – Letter Writing/Resume Writing/ e-correspondence/ Technical Report Writing
4. **Presentation Skills** – Oral Presentations (individual or group) through JAM Sessions/Seminars/PPTs and Written Presentations through Posters/Projects/Reports/ e-mails/Assignments… etc.,
5. **Group Discussion and Interview Skills** – Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas and Rubrics of Evaluation- Concept and Process, Pre-interview Planning, Opening Strategies, Answering Strategies, Interview through Tele-conference & Video-conference and Mock Interviews.

References:

1. Kumar, Sanjay and Pushp Lata. ***English for Effective Communication***, Oxford University Press, 2015
2. Konar, Nira. ***English Language Laboratories – A Comprehensive Manual, PHI*** Learning Pvt. Ltd., 2011.

HUMAN VALUES AND PROFESSIONAL ETHICS
MANDATORY COURSE (NON-CREDIT)

III-B.Tech-I-Sem **L T P C**
Subject Code: 17HS3109MC **3 0 0 0**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO6	PO7	PO8	PO12
CO1	apply the importance of human values for personal and societal development	3	3	3	2
CO2	develop ethics and professional attitude	2	2	3	2
CO3	explain ethical standards in a professional environment	3	3	3	2
CO4	distinguish between professional rights and employee rights	3	3	3	2
CO5	identify their role in professional spheres	3	3	3	3

Unit I

Human Values: Morals, values, ethics – integrity – work ethics –service learning –civic virtue – respect for others- living peacefully - Caring –sharing –honesty – courage –valuing time – cooperation – commitment –empathy – self-confidence –spirituality – character- Mini-Cases

Unit II

Professional Ethics: Profession- and professionalism - Two models of professionalism –Professional etiquette -Three types of Ethics or morality Responsibility in Engineering – Engineering standards – Engineering Ethics – Positive and Negative Faces. Professional Codes and Code of conduct of Institute of Engineers . Mini-cases .

Unit III

Professional Responsibilities: Ethical standards Vs Professional Conduct – Zero Tolerance for Culpable Mistakes – Hazards and Risks - congeniality, collegiality and loyalty. Respect for authority – conflicts of interest –Mini-Cases.

Unit IV

Professional Rights: professional rights and employee rights communicating risk and public policy – Whistle blowing - Professionals /engineers as managers, advisors, experts, witnesses and consultants – moral leadership- Monitoring and control- Mini-Cases

Unit V

Ethics in global context: Global issues in MNCs- Problems of bribery, extortion, and grease payments – Problem of nepotism, excessive gifts – paternalism – different business practices – Negotiating taxes - Mini-Cases

References

1. S B George, *Human Values and Professional Ethics*, Vikas Publishing.
2. KR Govindan & Saenthil Kumar: Professional *Ethics and Human Values*, Anuradha Publications.
3. S K Chakraborthy & D.Chakraborthy: *Human Values and Ethics*, Himalaya.
4. M. Govindarajan, S. Natarajan, & V.S. Senthilkumar: *Engineering Ethics(Includes Human Values)*, HI Learning Pvt. Ltd., New Delhi – 110001

QUANTITATIVE APTITUDE
MANDATORY COURSE (NON-CREDIT)

III-B.Tech-I-Sem **L T P C**
Subject Code: 17BS3110MC **0 0 2 0**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO9	PO10
CO1	Recall the basics of number systems and apply them accordingly	3	3
CO2	Apply the concepts of percentages, profit and loss, & Interests in real life situations	3	3
CO3	demonstrate various principles related to Distance ,speed ,time and work in solving mathematical problems	3	3
CO4	distinguish between permutations and combinations ,clocks and calendars for solving problems	3	3
CO5	apply principles of geometry and menstruation to achieve qualitative results at workplace	3	3

Unit-I

Number Systems - Basic Concepts, Number Systems: Natural numbers, whole numbers, integers, fractions (proper, improper, mixed, split), Rational Numbers, Irrational Numbers, Real Numbers.
Divisibility Rules, Logic Equations,Two digit numbers,three digit numbers, successive divisions, basic operations(addition,subtraction,multiplication,division) Averages.
Basic Concepts combined mean, average principles, wrong values taken, number added or deleted, average speed. Progressions & Inequalities
Basic Concepts, Types: arithmetic, geometric, harmonic progression and applications.

Unit-II

Percentages
Basic Concepts, conversions, finding percentages from given numbers, quantity increases or decreases by given percentage, population increase by given percentage, comparisons, consumption when a commodity price increase or decrease and applications Profit and Loss.
Basic Concepts, discounts, marked price and list price, dishonest shopkeeper with manipulated weights, successive discounts etc
Interest (Simple and Compound)
Basic Concepts, Yearly, Half-yearly, and quarterly calculations , multiples, differences between simple and compound interest.
Ratio and Proportion
Basic Concepts of ratio and proportion, continued or equal proportions, mean proportions, invest proportion, alternative proportion, division proportion, compound proportion, duplication of ratio, finding values, coins and currencies, etc

Unit-III

Speed, Time and Distance: Basic Concepts, Single train problems,two train problems:some point same side, some point opposite sides, relative speed, different points meeting at common points, different points same side(different timings vs. same timings), ratios, number of stoppages, average speed, etc.
Time and Work: Basic Concepts, comparative work, mixed work, alternative work ,middle leave and middle join,ratio efficiency.

Unit-IV

Permutations and combinations
Basic Concepts, differences between permutations and combinations,always together-never together, alternative arrangement, fixed positions,double fixations, items drawing from a single group, items drawing from a multiple group, total ways of arrangement with repetitions and without repetitions,dictionary, handshakes or line joining between two points or number of matches , sides and diagonals,etc.

Clocks and Calendars: Basic Concepts, Angle between minute hand and hour hand,reflex angle,hours hand angle,time gap between minute hand and hour hand ,relative time : coincide ,opposite sides and right angle ,mirror images,faulty clock(slow/fast),miscellaneous, calender.

Unit-V

Geometry and Mensuration: Basic concepts, types of angles, Plane figures: rectangles, squares, triangles, quadrilateral, areas, perimeters, etc

Solid figures: cubes, cuboids, spheres, cylinders-area (total ot lateral surface area), volumes, perimeters.

Others: Parallelogram, Rhombus, Trapezium, Circle, Sector, Segment, Cone, Sphere, Hemisphere, Ellipse, Starprism etc

Text Books:

1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials
3. R S Agarwal, S.Chand, 'A modern approach to Logical reasoning'
4. R S Agarwal, S Chand, 'Quantitative Aptitude'
5. Quantitative Aptitude - G. L BARRONS
6. Quantitative Aptitude - Abhijit Guha Mc Graw Hills

III-B.TECH.-II-SEMESTER SYLLABUS

THERMAL ENGINEERING - II

III-B.Tech-II-Sem **L T P C**
Subject Code: 17ME3201PC **4 0 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO6	PO12	PO14
CO1	explain Rankine cycle, working of boilers and its accessories	3	3	3	3
CO2	estimate the performance of steam nozzles	3	3	3	3
CO3	evaluate the performance of steam turbines	3	3	3	3
CO4	outline the working of steam condensers, gas turbines and their performance parameters	3	3	3	3
CO5	assess the performance of turbo jet engines	3	3	2	3

Unit -I

Basic Concepts: 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.

Unit-II

Steam Nozzles: Function of nozzle – applications - 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

Part-A: 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, Brief concepts about compressors, combustion chambers and turbines of Gas Turbine Plant.

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.

Textbooks:

1. Thermal Engineering, R.K. Rajput, Lakshmi Publications.
2. Gas turbines – V Ganesan – TMH.

References:

1. Gas turbines and propulsive system – P khajuria& S.P. Dubey Dhanpatrai.
2. Thermal Engineering –P.L.Bellaney, Khanna Publishers.
3. Thermal Engineering –R.S.Khurmi, JS Gupta, S.Chand.

HEAT TRANSFER

III-B.Tech-II-Sem **L T P C**
Subject Code: 17ME3202PC **4 1 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12	PO14
CO1	compute one dimensional steady state conduction heat transfer	3	3	3	3	3
CO2	solve transient heat conduction problems for simple geometries	3	3	3	3	3
CO3	analyze forced and natural convective heat transfer	3	3	3	3	3
CO4	design heat exchangers using LMTD and NTU methods	3	3	3	3	3
CO5	explain the principles of radiation	3	3	3	3	3

Unit-I

Introduction: Modes and mechanisms of heat transfer: Basic laws of heat transfer – simple general discussion about applications of heat transfer.

Conduction Heat transfer: Fourier rate equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates.Simplification and forms of the field equation-steady, unsteady and periodic heat transfer-initial and boundary conditions.

One dimensional Steady state conduction Heat transfer: Homogeneous slabs, hollow cylinders and sphere - composite systems - overall heat transfer coefficient - Electrical analogy - Critical radius of insulation.

Unit-II

One Dimensional Transient Conduction Heat Transfer: Variable Thermal conductivity-systems with heat sources or Heat generation-extended surfaces (fins) heat transfer – long fin, fin with insulated tip and short fin, application to error measurement of temperature.

One dimensional transient conduction heat transfer: Systems with negligible internal resistance-significance of Biot and Fourier numbers-infinite bodies-chart solutions of transient conduction systems.

Unit-III

Convective Heat Transfer: Classification of system based on causation of flow, condition of flow, configuration of flow and medium of flow – dimensional analysis as a tool for experimental investigation- Buckingham Pi Theorem and method, application for developing semi – empirical non – dimensional correlation for convection heat transfer – significance of non-dimensional numbers – concepts of continuity, Momentum and energy equations-Integral method as approximate method.

Forced convection: External flows - concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer – Flat plates and cylinders.

Unit-IV

Internal Flows: Concepts about hydrodynamic and thermal entry lengths – Division of internal flow - use of empirical relations for horizontal pipe flow and annulus flow.

Free convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate use of empirical relations for vertical plates and pipes.

Heat Exchangers: Classification of heat exchanger – overall heat transfer coefficient and fouling factor – concepts of LMTD and NTU methods –problems using LMTD and NTU methods.

Unit-V

Heat Transfer with phase change: Boiling: - Pool boiling – Regimes - calculations on nucleate boiling, critical heat flux and film boiling.

Radiation heat transfer: Emission characteristics and laws of black-body radiation-irradiation total and monochromatic quantities- laws of Planck, Wien, Kirchhoff, Lambert, Stefan and Boltzmann -heat exchange between two black bodies- concepts of shape factor- emissivity- heat exchange between grey bodies- radiation shields- electrical analogy for radiation networks.

Textbooks:

1. Fundamentals of Engineering Heat and MassTransfer, R.C.Sachdeva, New Age International Publisher.
2. Heat Transfer, P. K. Nag, TMH.

References:

1. Fundamentals of Heat and Mass Transfer – Cengel and Ghajar - TMH.
2. Heat and mass transfer –Heat and mass transfer – R K Rajput- S. Chand & Company.
3. Heat and mass transfer – D S Kumar- S K Kataria& Sons.

DESIGN OF MACHINE MEMBERS – II

III-B.Tech-II-Sem **L T P C**
Subject Code: 17ME3203PC **4 1 0 4**

Note: Design Data Book is permitted. Design of all components should include design for strength and rigidity apart from engineering performance requirements.

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO8	PO12	PO13
CO1	analyse the importance of sliding contact bearings	3	3	2	3	3
CO2	design the different types of rolling contact bearings	3	3	2	3	3
CO3	explain the concepts of springs and power transmission systems	3	3	3	3	3
CO4	design different categories of engine parts	3	3	3	3	3
CO5	evaluate the design procedure for gears and power screws	3	3	3	3	3

Unit-I

Sliding contact bearings: Types of Journal bearings – Lubrication –Bearing Characteristic Number and Bearing Modulus –Full and partial bearings – Clearance ratio – Heat Generated and dissipation of bearings, journal bearing design, Properties of Sliding Contact Bearing, Bearing materials.

Unit-II

Rolling contact bearings: Types of Rolling Contact bearings, Ball and roller bearings – Static load – dynamic load – equivalent radial load – Reliability of a Bearing - design and selection of ball & roller bearings.

Unit-III

Mechanical Springs: Stresses and deflections of helical springs – Extension and compression springs – Design of springs for fatigue loading – Energy storage capacity.

Belts & Pulleys: Transmission of power by Belt and Rope ways, Transmission efficiencies, Belts – Flat and V types, Ropes Drive.

Unit-IV

IC Engine Parts: Piston- Forces acting on piston – Construction, Design and proportions of piston. Connecting Rod: Thrust in connecting rod – stresses due to whipping action on connecting rod ends.

Unit-V

Gears: Spur gears & Helical gears- Brief introduction involving important concepts – Design of gears using AGMA procedure involving Lewis and Buckingham equations. Check for dynamic and wear considerations.

Design of Power Screws: Design of screw. Square, ACME, Buttress screws, Stresses in Power Screws. Compound screw, Differential screw, possible failures.

Textbooks:

1. Machine tool design, V.B. Bhandari, TMH.
2. Design of Machine Elements, Spotts, Pearson.

References:

2. Design of Machine Elements-II, Annaiah, New Age.
3. Design of Machine Elements, Sharma and Purohit, PHI.
4. Mechanical Engineering Design, Richard G. Budyanas and J. Keith Nisbett, Shygley.

Data Books:

1. Design Data Book - P.S.G. College of Technology.
2. Design Data Book – P.V Ramana Murti, M. Vidhyasagar, BS Publications.

GLOBAL WARMING & CLIMATE CHANGE
(Open Elective – II)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: 17CE3204OE **3 0 0 3**

Pre Requisites: Environmental science

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO6	PO7	PO8	PO12
CO1	describe the various consequences of climate change	3	3	3	3	2
CO2	illustrate the methods of measurement of climate change	3	3	3	3	2
CO3	analyze the causes for climate change and its impacts	3	3	3	3	2
CO4	evaluate the impact of global warming and climate change	3	3	3	3	2
CO5	explain various mitigation techniques	3	3	3	3	2

Unit – I

Global warming and Greenhouse gases – GHGs trend, Global temperature trend, Global distribution of emissions, IPCC Sources of CO2 in the Land, Ocean and atmosphere. The Climate system – Sun, Atmosphere, Ocean, Ice and energy balance of the earth. History of climate change – glacial cycle , interglacial, interstadial events, year to decadal

Global Warming Potential: Introduction to the calculation of GWP, carbon emissions from fossil fuels and global carbon cycle, carbon intensity of fossil fuels, Effects of energy efficiency on carbon intensity, target CO2 levels.

Unit – II

The Kyoto Protocol, Climate change –Extreme weather events, The Measurement of Climate Change, Global warming and the hydrological cycle, Climate change impact on ecosystems, Agriculture, Possible remedies of global warming – Reducing Carbon Emissions, Energy use and Emission trading, Future Emissions and Energy Resources, Current and Future sources of Methane, Biological sources of Nitrous oxide, Role of Scientist and Human being.

Unit – III

The history of climate and the human species, human-caused climate change, Impacts Of Climate Change: 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

Weather and Climate – Climatic zones, continental & maritime climates; Climate change and variability – Natural changes and anthropogenic causes of climate change, Climate feedbacks – Ice-albedo, cloud - albedo and CO2 feedbacks; Present day Climate variability – El Nino and ENSO events. Climate Change Adaptation And Mitigation Measures: Adaptation Strategy/Options in various sectors – Water – Agriculture –- Infrastructure and Settlement including coastal zones – Human Health – Tourism – Transport – Energy – Key

Unit –V

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. Clean Technology And Energy: Clean Development Mechanism –Carbon Trading examples of future Clean Technology- Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power – Mitigation Efforts in India and Adaptation funding.

Textbooks:

1. Dash Sushil Kumar, “Climate Change – An Indian Perspective”, Cambridge University Press India Pvt. Ltd, 2007.

2. Kuhn, T.S., 1962 and updates. The Structure of Scientific Revolutions
3. Contemporary Climatology, by Peter J. Robinson and Ann Henderson-Sellers.
4. Climate Change: A Multidisciplinary Approach, by William James Burroughs
5. Current trends in Global Environment by A.L. Bhatia (2005)

References:

1. Global Warming: A Very Short Introduction by Mark Maslin
2. Global Warming The Complete Briefing by John T Houghton
3. Intergovernmental Panel on Climate Change, (Cambridge University 2007)
4. Ruddiman, William F.2001. Earth's Climate: Past and Future
5. Henderson-Sellers, A., and P.J. Robinson, 1999. Contemporary Climatology (second edition). Prentice-Hall.
6. Houghton, J.T., 2001, (ed). Climate Change 2001, The Scientific Basis. 881pp.

FUNDAMENTALS OF ROBOTICS
(Open Elective – II)

III-B.Tech-II-Sem **L T P C**
Subject Code: 17ME3204OE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO5	PO12
CO1	illustrate principles and functioning of the robot	3	2	2	2
CO2	perform kinematic analysis for end-effector positioning	3	3	3	2
CO3	integrate sensors for robot	3	3	3	2
CO4	design control laws for a robot	3	3	2	2
CO5	develop robot programming for various applications	3	3	3	2

Unit-I

Introduction to Robotics: Types and components of a robot, Classification of robots, classification with respect to geometrical configuration (anatomy), closed-loop and open- loop control systems. Social issues and safety.

Unit-II

Robot Kinematics: Kinematics systems, Definition of mechanisms and manipulators, Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, Homogeneous Coordinate representation, DH parameters.

Unit-III

Sensors and Vision System: Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc., Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean / Similarity / Affine / Projective transformations Vision applications in robotics.
Robot Actuation Systems: Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

Unit –IV

Robot Control: Basics of control: Transfer functions, Control laws: P, PD, PID, Non-linear and advanced controls.

Unit-V

Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications.

Textbooks:

1. Niku Saeed B., “Introduction to Robotics: Analysis, Systems, Applications”, PHI, New Delhi.
2. Mittal R.K. and Nagrath I.J., “Robotics and Control”, Tata McGraw Hill.

References:

1. Saha, S.K., “Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, 2014.
2. Ghosal, A., “Robotics”, Oxford, New Delhi, 2006.

PRINCIPLES OF COMMUNICATION SYSTEMS
(Open Elective – II)

III -B.Tech.-II-Sem **L T P C**
Subject Code: 17EC3204OE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	outline the fundamentals of communication systems	3	2	2	2
CO2	analyze various analog modulation and demodulation schemes	3	3	3	2
CO3	explain sampling theorem, pulse modulation and multiplexing techniques	3	3	3	2
CO4	illustrate digital modulation schemes	3	3	2	2
CO5	develop source and channel coding techniques	3	3	3	2

Unit-I

Fundamentals of communication systems: Block diagram of communication system; types of communications-analog and digital; Noise–types of noise, sources of noise, calculation of noise in linear systems, and noise figure.

Unit-II

Methods of Modulation: Need for modulation; Types of modulation, generation and detection of AM, DSB-SC, SSB-SC. Angle modulation: frequency & phase modulations, Narrow band and Wide band FM, comparison of AM, FM & PM.

Unit-III

Pulse Modulations: Sampling theorem, Nyquist criteria, introduction to PAM, PWM and PPM.
Multiplexing techniques: TDM, FDM, asynchronous multiplexing.

Unit-IV

Digital Communication: Advantages; Working principle of PCM; comparison of PCM, DM, ADM, ADPCM; introduction to digital modulation techniques-ASK, FSK, PSK, DPSK, QPSK.

Unit-V

Information Theory: Concept of information; rate of information and entropy; Coding efficiency-Shanon-Fano and Huffman coding; introduction to error detection and correction codes.

Textbooks:

1. Communication Systems Analog and Digital – R.P. Singh & SD Sapre, TMH, 20th reprint, 2004.
2. Principles of Communications – H. Taub and D. Schilling, TMH, 2003.

References:

1. Electronic Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.
2. Communication Systems Engineering – John. G. Proakis and Masoud Salehi, PHI, 2nd Ed. 2004.

DATABASE MANAGEMENT SYSTEMS
(Open Elective – II)

III-B.Tech- II Sem **L T P C**
Subject Code: 17CS3204OE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO5	PO12
CO1	design databases using E-R model	3	3	3	3	2
CO2	construct database using relational model	3	3	3	3	2
CO3	formulate SQL queries to interact with database	3	3	3	3	2
CO4	make use of transaction control commands	3	3	3	3	2
CO5	apply normalization on database to eliminate redundancy	3	3	3	3	2

Unit-I

Introduction to Database Systems: Introduction and applications of DBMS, Purpose of data base, History of database, Database architecture - Abstraction Levels, Data Independence, Database Languages, Database users and DBA.
Introduction to Database Design: Database Design Process, Data Models, ER Diagrams - Entities, Attributes, Relationships, Constraints, keys, Generalization, Specialization, Aggregation, Conceptual design with the E-R model for large Enterprise.

Unit-II

Relational Model: Introduction to the relational model, Integrity constraints over relations, Enforcing integrity constraints, Querying relational data, Logical database design: E-R to relational, Introduction to views, Destroying/altering tables and views.

Unit-III

Part-A: SQL Basics: DDL, DML, DCL, structure – creation, alteration, defining constraints – Primary key, foreign key, unique, not null, check, in operator.

Part-B: Functions: Aggregate functions, Built-in functions - numeric, date, string functions, set operations.

Unit-IV

Sub-queries: Introduction, correlated sub-queries, use of group by, having, order by, join and its types, Exist, Any, All, view and its types.
Transaction control commands: ACID properties, concurrency control, Commit, Rollback, save point, cursors, stored procedures, Triggers.

Unit-V

Normalization: Introduction, Normal forms - 1NF, 2NF, 3NF, BCNF, 4NF and 5NF, concept of De-normalization and practical problems based on these forms.

Textbooks:

1. Raghurama Krishnan, Johannes Gehrke, Database Management Systems, 3rd Edition, TMH.
2. Abraham Silberschatz, Henry F.Korth, S.Sudarshan, Database System Concepts, 6th Edn, TMH.

AUTOMOBILE ENGINEERING
(Professional Elective-I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME3205PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO6	PO7	PO12	PO14
CO1	explain various components of the automobile and its functions	3	3	3	3
CO2	outline the cooling and electrical systems in automobile	3	3	3	3
CO3	illustrate the transmission system and function of its elements	3	3	3	3
CO4	demonstrate the elements of braking and steering systems	3	3	3	3
CO5	summarize the emission control methods used in automobiles	3	3	3	3

Unit-I

Introduction: Layout of automobile – introduction chassis and body components. Types of Automobile engines – Power unit – Introduction to engine lubrication – engine servicing Fuel System: S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pump – filters – carburetor – types – air filters – petrol injection. Introduction to MPFI and GDI Systems. C.I. Engines: Requirements of diesel injection systems, types of injection systems, DI Systems IDI systems. Fuel pump, nozzle, spray formation, injection timing, testing of fuel pumps. Introduction to CRDI and TDI Systems.

Unit-II

Cooling System: Cooling Requirements, Air Cooling, Liquid Cooling, Thermo, water and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporative 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. **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.

Unit-III

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, constant mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter.

Propeller shaft – Hotch – Kiss drive, Torque tube drive, universal joint, differential rear axles – types – wheels and tyres. Suspension System: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

Unit-IV

Braking System: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.
Steering System: Steering geometry – camber, castor, king pin rake, combined angle toein, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

Unit-V

Emissions from Automobiles – Pollution standards National and international – Pollution Control – Techniques – Multipoint fuel injection for SI Engines. Common rail diesel injection Energy alternatives – Solar, Photo-voltaic, hydrogen, Biomass, alcohols, LPG, CNG, liquid Fuels and gaseous fuels, Hydrogen as a fuel for IC Engines. - Their merits and demerits. Standard Vehicle maintenance practice.

Textbooks:

1. Automobile Engineering, Dr. Kirpal Singh, Vol I & II, Standard Publishers.
2. A Text Book Automobile Engineering–Manzoor Hussain, Nawazish Mehdi & Yosuf Ali, Frontline Publications.

References:

1. A Text Book of Automobile Engineering by R K Rajput. Laxmi Publications.
2. Automotive Mechanics, Heitner.
3. Automotive Engines, Srinivasan.

NANOTECHNOLOGY
(Professional Elective-I)

III-B.Tech.-II-Sem. **L T P C**
Subject Code: 17ME3206PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO5	PO6	PO7	PO12	PO13
CO1	describe nano materials based on their dimensionality	3	3	3	3	3	3	3
CO2	correlate properties with structures of nano materials	3	3	3	3	3	3	3
CO3	summerize bottom up and topdown approaches for developing nano materials	3	3	3	3	3	3	3
CO4	choose characterization techniques and study the nano material properties	3	3	3	3	3	3	3
CO5	relate fields of nanotechnology in specific applications	3	3	3	3	3	3	3

Unit – I

Introduction: History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges and Future Prospects.

Unit - II

Unique Properties of Nanomaterials: Microstructure and Defects in Nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries,Effect of Nano - dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility, Magnetic Properties: Soft magnetic Nanocrystalline alloy, Permanent magnetic Nanocrystalline materials, Giant Magnetic Resonance. Electrical Properties, Optical Properties, Thermal Properties and Mechanical Properties

Unit – III

Synthesis Routes: Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Sol - gel method, Self-assembly,
Top down approaches: Mechanical alloying, Nano – lithography

Unit – IV

Tools to Characterize Nanomaterials: X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three - dimensional Atom Probe (3DAP)

Unit-V

Applications of Nanomaterials: Nano-electronics, Nano-electromechanical systems (NEMS), Nanosensors, Nanocatalysts, Food and Agricultural Industry, Structure and Engineering, Automotive Industry, Water-Treatment and the environment, Nano-medical applications, Energy, Defense and Space Applications.

Text Books:

1.Text Book of Nano Science and Nano Technology –B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.
2. Introduction to Nanotechnology –Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

References Books:

1. Nano: The Essentials by T.Pradeep, Mc Graw-Hill Education.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L.Schodek.
3. Transport in Nano structures-David Ferry, Cambridge University press 2000
4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact Ed. Challa S.,S. R. Kumar, J. H. Carola.

AUTOMATION IN MANUFACTURING
(Professional Elective-I)

III-B.Tech-II-Sem **L T P C**
Subject Code: 17ME3207PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO12	PO13	PO14
CO1	illustrate the fundamentals of CNC part programming	3	3	3	3	3	3
CO2	explain CNC machine elements and system devices	3	3	3	3	3	3
CO3	make use of tooling, cooling and fixturing systems for CNC machines	3	3	3	3	3	3
CO4	create various Rapid Prototyping data files	3	3	3	3	3	3
CO5	outline the various applications of Rapid Prototyping	3	3	3	3	3	3

Unit-I

Numerical Control (NC): Basic components of NC System, NC procedure, NC machine tools, NC Machining centres-types, CNC Part Programming-fundamentals, Manual part-programming - Computer Aided Part Programming (APT).

Unit-II

CNC Machine Elements: Machine structure, Guideways, feed drives, spincles, spindle bearings.
System Devices: Drives, feed devices, counting devices. Interpolators for manufacturing systems: DDA integrator, DDA hardware interpolators, CNC software interpolators.

Unit-III

Tooling for CNC Machines: Interchangeable tooling system, preset and qualified tools, coolant fed tooling system.
Modular fixturing, quick change cooling system, automatic head changers.

Unit–IV

Rapid Prototyping Data Formats: STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Other Translators, Newly Proposed Formats. Rapid Prototyping Software's: Features of various RP softwares like Magic's, Mimics, Solid View, View Expert, 3-D View, Velocity 2 , Rhino, STL View 3 Data Expert and 3-D doctor.

Unit–V

RP Applications: Application –Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture.

Textbooks:

1. Computer control of manufacturing systems- Yoram Koren, TMH, 2009
2. Rapid prototyping: Principles and Applications -Chua C.K., Leong K.F. and LIM C.S, World Scientific publications , Third Edition, 2010

References:

1. Computer Numerical Control- Operations and Programming- Jon Stenerson and Kelly Curron Pul, 3rd Edition.
2. Mechatronics-HMT, TMH.
3. Rapid Manufacturing –D.T. Pham and S.S. Dimov, Springer , 2001

MECHANICS OF COMPOSITE MATERIALS
(Professional Elective-I)

III-B.Tech-II-Sem **L T P C**
Subject Code: 17ME3208PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO4	PO12	PO13
CO1	explain the applications of composite materials	3	3	3	3	3
CO2	illustrate the concepts of fiber reinforced plastic processing	3	3	3	3	3
CO3	differentiate micro and macro mechanics of composite lamina	3	3	3	3	3
CO4	apply failure criteria and critically evaluate the results	3	3	3	3	3
CO5	analyze the mechanical behavior of metal matrix composites	3	3	3	3	3

Unit- I

Introduction to Composite Materials Applications: Introduction to Composite Materials: Definition, classification and characteristics of composite Materials – fibrous composites, laminated composites, particulate composites. Applications: Automobile, Aircrafts. Missiles. Space hardware, Electrical and electronics, Marine, recreational and sports equipment, future potential of composites.

Unit-II

Fiber Reinforced Plastic Processing : Lay up and curing, fabricating process, open and closed mould process, hand lay up techniques; structural laminate bag molding, production procedures for bag molding; filament winding, pultrusion, pulforming, thermo-forming, injection molding, blow molding.

Unit-III

Micro Mechanics of a Lamina: Introduction, Evaluation of the four elastic moduli by Rule of mixture, Numerical problems.
Macro Mechanics of a Lamina: Hooke's law for different types of materials, Number of elastic constants, Two - dimensional relationship of compliance and stiffness matrix.

Unit-IV

Biaxial Strength Theories: Maximum stress theory, Maximum strain theory, Tsai-Hill theory, Tsai, Wu tensor theory, Numerical problems.
Macro Mechanical Analysis of Laminate: Introduction, code, Kirchoff hypothesis, CL T, A, B, and D matrices (Detailed derivation), Special cases of laminates, Numerical problems.

Unit-V

Metal Matrix Composites Fabrication Process for MMCs: Metal Matrix Composites: Reinforcement materials, types, characteristics and selection base metals selection. Need for production MMC's and its application. Fabrication Process for MMC's: Powder metallurgy technique, liquid metallurgy technique and secondary processing, special fabrication techniques.

Textbooks:

1. Mechanics of Composite Materials/ R. M. Jones, TMH, New York, 1975.
2. Engineering Mechanics of Composite Materials, Isaac and M Daniel, Oxford University Press.

References:

1. Analysis and performance of fibre Composites, B. D. Agarwal and L. J. Broutman, Wiley- Inter Science, New York, 1980.
2. Mechanics of Composite Materials, 2nd Edition, Autar K. Kaw, Publisher: CRC.

HEAT TRANSFER LAB

III-B.Tech-II-Sem **L T P C**
Subject Code: 17ME3209PC **- - 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO6	PO7	PO14
CO1	find thermal conductivity of common metallic materials	3	3	3	3
CO2	calculate heat transfer rate between fluid and solid boundaries	3	3	3	3
CO3	evaluate the performance of heat exchangers	3	3	3	3
CO4	determine the emissivity and Stefan Boltzmann constant for radiation	3	3	3	3
CO5	estimate heat transfer coefficient in natural,forced convection	3	3	3	3

List of Experiments (perform any 12 experiments):

1. Composite Slab Apparatus – overall heat transfer coefficient
2. Heat transfer through Lagged pipe
3. Heat transfer through a Concentric Sphere
4. Thermal conductivity of given metal rod
5. Heat transfer in pin fin
6. Experiment on Transient Heat Conduction
7. Heat transfer in forced convection apparatus
8. Heat transfer in natural convection
9. Parallel and counter flow Heat Exchanger
10. Emissivity apparatus
11. Stefan Boltzmann apparatus
12. Critical heat flux apparatus
13. Study of heat pipe and its demonstration
14. Film and Drop wise condensation apparatus

PRODUCTION DRAWING PRACTICE

III-B.Tech-II-Sem **L T P C**
Subject Code: 17ME3210PC **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO6	PO10	PO13	PO14
CO1	explain the concepts of conventional representation of machine components	3	3	3	3	3	3
CO2	apply limits, fits and tolerances for a given part drawing	3	3	3	3	3	3
CO3	represent the types of surface roughness and various treatment indications	3	3	3	3	3	3
CO4	create detailed part drawings including tolerances from assembly using CAD	3	3	3	3	3	3
CO5	create drawing of parts from assembly using CAD software	3	3	3	3	3	3

Unit – I
Conventional representation of materials: Conventional representation of parts – Screw joints, welded joints, springs, gears, electrical, hydraulic and pneumatic circuits – Methods of indicating notes on drawings.
Limits, Fits & Tolerances: Types of fits, exercises involving selection / Interpretation of fits and estimation of limits from table

Unit – II
Form & Positional Tolerances: Introduction and indication of form and positional tolerances on drawings, types of run out, total run out and their indication

Unit – III
Surface roughness and its indication: Definitions – finishes obtainable from various manufacturing Processes, recommended surface roughness on mechanical components. Heat treatment and surface treatment symbols used on drawings

Unit – IV
Detailed and Part drawings: Drawing of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc.

Unit – V
Part drawing using computer aided drafting by CAD software

Text Books:
1. Production and Drawing – K.L. Narayana & P. Kannaiah/ New Age
2. Machine Drawing with Auto CAD- Pohit and Ghosh, PE

References:
1. Geometric dimensioning and tolerance- James D. Meadows/ B.S Publications
2. Engineering Metrology, R.K. Jain, Khanna Publications

METROLOGY LAB

III-B.Tech-I-Sem **L T P C**
Subject Code: 17ME3211PC **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO6	PO14
CO1	identify methods and devices for measurement of length	3	3	3	3
CO2	make useof methods and devices for measurement of angle	3	3	3	3
CO3	measure gear parameters	3	3	3	3
CO4	compare pitch and flank angle of a screw thread with standard gauge	3	3	3	3
CO5	experiment with tool maker's microscope	3	3	3	3

List of Experiments

1. Measurement of lengths, heights, diameters by vernier calipers, micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear teeth, vernier calipers and checking the chordal addendum and chordal height of spur gear.
4. Alignment test on the lathe.
5. Study of Tool makers microscope and its application
6. Angle and taper measurements by Bevel protractor.
7. Angle and taper measurements by Sine bar.
8. Use of spirit level in finding the flatness of surface plate.
9. Use Optical Flats in finding flatness of surface plate.
10. Thread measurement by Two wire/ Three wire method.

SOFT SKILLS
MANDATORY COURSE (NON-CREDIT)

III-B.Tech-II-Sem **L T P C**
Subject Code: 17HS3212MC **0 0 2 0**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO9	PO10
CO1	identify the need for self awareness and exhibit professional attitude	3	3
CO2	interpret and improve in personal and professional communication	3	3
CO3	develop leadership skills and enhance the employability	3	3
CO4	recognize the importance of decision making and change management to improve professional attributes	3	3
CO5	apply interview techniques for overall development	3	3

Unit I
Grammar Fundamentals, Basic Sentence Structure, Parts of Speech, The Noun - The Adjective - Articles – Pronouns - The Verb - The Adverb - The Preposition - The Conjunction - The Interjection

Unit II
Synonyms and Antonyms - Homonyms and Homophones - Word Formation - Idioms and Phrases – Analogy - One-word Substitutes.

Unit III
Errors in English, Vocabulary Enhancement, Using a dictionary

Unit IV
Paragraph writing, Essay writing, Letter Writing, E-mail Writing, Picture Description

Unit V
Sentence Equivalence, Text Completion, Comparison and Parallelism

Activities
- Regular practice tests.
- Quiz, Crossword, Word-search and related activities.
- Picture Description

TEXT BOOKS
1. Essential English Grammar by Raymond Murphy
2. High School English Grammar and Composition by Wren and Martin

References
1. The Oxford English Grammar by Sidney Greenbaum.
2. English Skills for Technical Studentsby Amaresh Mukherjee, Sankarnath Ghosh and Prabir Ghosh, Orient Longman Pvt Ltd.
3. Basis of Communication in Englishby Francis Soundararaj.
4. Verbal Ability and Reading Comprehension for the CAT by Nishit K Sinha.

IV-B.TECH.-I-SEMESTER SYLLABUS

CAD/CAM

IV-B.Tech-I-Sem **L T P C**
Subject Code: 17ME4101PC **4 1 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO12	PO13
CO1	describe various CAD devices, software and coordinate systems	3	3	3	3
CO2	apply homogeneous transformations on various geometric models	3	3	3	3
CO3	construct both analytical and synthetic entities using parametric representations	3	3	3	3
CO4	build surface models using different representation schemes	3	3	3	3
CO5	create solid primitives using the different representation schemes	3	3	3	3

Unit—I

Fundamentals of CAD/CAM: Product cycle, CAD/CAM process, CAD/CAM tools, Benefits of CAD/CAM, **CAD/CAM hardware:** basic structure, CPU, memory types, Computer peripherals for CAD: Design workstation, Graphic terminal, **and CAD software:** definition of system software and application software, CAD database and structure.

Geometric Modeling: 3-D wire frame modeling, wire frame entities and their definitions, Interpolation and approximation of curves, Concept of parametric and non-parametric representation of curves, Synthetic cures: Cubic spline, Bezier, and B-spline.

Unit-II

Surface modeling: Surface frame entities and their definitions, Parametric space of surface, parameterization of surface patch, Plane surface, Tabulated Cylindrical surface, Ruled surface, Surface of revolution, Blending surface, Hermite bicubic surface, Bezier surface. **Solid Modeling:** Solid entities, Boolean operations, Sweep representation, Constructive solid geometry, Boundary representations.

Unit — III

NC Control: Definition, Elements of NC system, NC procedure, NC coordinate system, NC modes, applications and advantages of NC system. NC part programming: Methods of NC part programming, Manual part programming (examples of 2D machining and
Turning problems), Computer assisted part programming (examples of APT programming problems with 2D machining only), Post Processor, NC part programming languages, CNC, DNC and Adaptive Control Systems. Features of machining center, turning center

Unit —IV

Group Technology: Part families, Parts classification and coding, Production flow analysis, advantages and limitations. **Computer aided process planning:** Difficulties in traditional process planning, retrieval type, generative type and Hybrid type of CAPP.

Unit—V

Computer aided quality control: Terminology in QC, computers in QC, Automated inspection- Off-line, On-line, Contact: Coordinate measuring machines and mechanical probes, Non-contact: Machine vision and Photogrammetry. **Computer integrated Manufacturing (CIM) system:** Types of manufacturing systems, Benefits of CIM

Text Books

1. CAD/CAM /Groover M.P/Pearson education.
2. CAD/CAM Concepts and Applications/ Alavala/ PHI.

Reference Books

1. CAD/CAM Principles and Applications/P.N.Rao/ TMH.
2. CAD/CAM Theory and Practice/ Ibrahim Zeid and R.Sivasubramanian/TMH.
3. CAD/CAM/CIM/Radhakrishnan and Subramanian/New Age.

INSTRUMENTATION & CONTROL SYSTEMS

IV-B.Tech-I-Sem **L T P C**
Subject code: 17ME4102PC **4 1 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12
CO1	explain dynamic performance characteristics and sources of error	3	2	2
CO2	use various displacement, temperature and pressure measuring instruments	3	2	2
CO3	choose various speed, flow, acceleration & vibration measuring instruments	3	3	2
CO4	select strain, humidity, force, torque and power measuring instruments	3	3	2
CO5	outline various control systems and position controller applications	3	3	2

Unit- I

Definition-Basic principles of measurement-measurement systems, generalized configuration and functional descriptions of measuring instruments- examples Dynamic performance characteristics-sources of error, classification and elimination of error.

Unit- II

Measurement of Displacement: Theory and construction of various transducers to measure displacement- piezo electric, inductive, capacitance, resistance, ionization, and photo electric transducers, calibration procedures.

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.

Unit- III

Measurement of Level: Direct Method- Indirect Methods- capacitative, ultrasonic, magnetic, Cryogenic fuel level Indicators- Bubbler level indicators.

Flow Measurement: Rota meter, Magnetic, Ultrasonic, Turbine flow meter, Hot- Wire Anemometer, Laser Doppler Anemometer (LDA).

Measurement of Speed: Mechanical Tachometers- Electrical Tachometers- Stroboscope, Non-contact type of Tachometers.

Measurement of Acceleration and Vibration: Different Simple instruments – Principles of Seismic instruments- Vibrometer and accelerometer using the 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, Torque meters, Dynamometers.

Unit-V

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. Measurement Systems: Applications and Design by D.S kumar, Anuradha Agencies.
2. Instrumentation, measurement and Analysis by B.C nakra and K.K Choudhary,TMH

References:

1. Instruments and Control systems, S.bhaskar, Anuradha Agencies.
2. Experimental methods of engineers, Holman.
3. Mechanical and Industrial Instruments, R.K Jain, Khanna Publishers.

FINITE ELEMENT METHODS

IV-B.Tech-I-Sem **L T P C**
Subject Code: 17ME4103PC **4 1 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO4	PO12	PO13
CO1	explain the fundamentals of FEM	3	2	2	3	3
CO2	solve the linear equations of truss & beam elements using FEM	3	3	3	3	3
CO3	evaluate the load and displacements for 2-D problems	3	3	3	3	3
CO4	apply the FE method for heat transfer problems	3	3	3	3	3
CO5	demonstrate the dynamic analysis for various objects using FEM	3	3	2	3	3

Unit- I

Introduction: Historical Background - Mathematical modeling of field problems in Engineering - Governing Equations - Weighted Residual Methods - Variational Formulation of Boundary Value Problems - Ritz Technique - Basic concepts of the Finite Element Method - Stress and Equilibrium. Boundary conditions. Strain - Displacement relations. Stress - strain relations for 2-D and 3-D Elastic problems.

One Dimensional Problems: Finite element modeling coordinates and shape functions. Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Quadratic shape functions. Temperature effects.

Unit- II

Analysis of Trusses: Stiffness Matrix for Plane Truss Elements, Stress Calculations and problems.

Analysis of Beams: Element stiffness matrix for two noded, two degrees of freedom per node beam element and simple problems.

Unit-III

Finite element modeling of two-dimensional stress analysis with constant strain triangles and treatment of boundary conditions, Estimation of Load Vector, Stresses.

Finite element modeling of Axi-symmetric solids subjected to Axi-symmetric loading with triangular elements. Two dimensional four noded Iso-parametric elements and problems.

Unit-IV

Steady State Heat Transfer Analysis: One dimensional analysis of slab, fin and two-dimensional analysis of thin plate. Analysis of a uniform shaft subjected to torsion.

Unit-V

Dynamic Analysis: Formulation of finite element model, element - Mass matrices, evaluation of Eigen values and Eigen vectors for a stepped bar, truss. Finite element - formulation to 3 D problems in stress analysis, convergence requirements, Mesh generation, techniques such as semi-automatic and fully Automatic use of softwares such as ANSYS, NISA, NASTRAN, etc.

Textbooks:

1. Introduction to Finite element analysis, S.Md.Jalaludeen, Anuradha Publications, Print-2012
2. Finite Element Methods: Basic Concepts and applications, Alavala, PHI.

References:

1. Introduction to Finite Elements in Engineering, Chandrupatla, Ashok and Belegundu, PHI.
2. Finite Element Method, Zincowitz, TMH.
3. A First Course in the Finite Element Method, Daryl Logan, Cengage Learning, 5th Edition.

ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective – III)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: 17CE4104OE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO6	PO7	PO10	PO12
CO1	identify the attributes to be considered for EIA	3	3	3	3
CO2	assess impact of deforestation	3	3	3	3
CO3	interpret impact prediction, significance of soil quality and mitigation	3	3	2	3
CO4	conduct environmental audit and prepare reports	3	3	2	3
CO5	illustrate environmental policies and provisions	3	3	3	3

Unit-I

Basic concept of EIA: Initial environmental Examination, Elements of EIA, factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters. E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

Unit-II

Assessment of impact of development activities on vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

Unit-III

Procurement of relevant soil quality, impact prediction, assessment of impact significance.
Identification and incorporation of mitigation measures for enhancement of soil quality.

Unit-IV

Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.

Unit-V

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Textbooks:

1. Environmental Pollution by R.K. Khitoliya S. Chand.
2. Environmental Impact Assessment, Barthwal, R. R. New Age International Publications.

References:

1. Larry Canter – Environmental Impact Assessment, TMH.
2. Suresh K. Dhaneja - Environmental Science and Engineering, S.K. Kataria & Sons Publication.
3. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication, Pvt., Ltd., Delhi.

PRINCIPLES OF ENTREPRENEURSHIP
(Open Elective – III)

IV-B.Tech. I-Sem. **L T P C**
Subject Code: 17ME4104OE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO7	PO8	PO9	PO11	PO12
CO1	illustrate concept & types of entrepreneurship	3	3	2	3	2
CO2	distinguish individual and corporate entrepreneurship	3	3	3	3	2
CO3	identify the process of launching new ventures	3	3	3	3	3
CO4	assess legal challenges of entrepreneurship	3	3	3	3	3
CO5	build entrepreneurial strategies	3	3	3	3	3

Unit-I: Entrepreneurship

The revolution impact of entrepreneurship- The evolution of entrepreneurship - Approaches to entrepreneurship- Process approach- Twenty first centaury trends in entrepreneurship.
Case: From candle seller to CEO (Arya Kumar P.No. 48).

Unit-II: Individual and corporate entrepreneurship

The entrepreneurial journey - Stress and the entrepreneur- the entrepreneurial ego- Entrepreneurial motivations - Corporate Entrepreneurial Mindset the nature of corporate entrepreneur.
Case: Globalizing Local Talent, (B. Janakiram, M. Rizwana, page 228).

Unit-III: Launching Entrepreneurial Ventures

Opportunities identification - entrepreneurial Imagination and Creativity - the nature of the creativity Process - Innovation and Entrepreneurship - Methods to initiate Ventures. Creating New Ventures - Acquiring an established entrepreneurial venture – Franchising - hybrid disadvantage of Franchising.
Case: creativity in start-ups (Arya Kumar Page 166).

Unit-IV: Legal challenges of Entrepreneurship

Intellectual Property Protection-Patents, Copyrights, Trademarks and Trade Secrets-Avoiding Pitfalls- Formulation of the entrepreneurial Plan- The challenges of new venture start-ups.
Case: Tata Motors – Nano (Arya Kumar P.No. 279).

Unit-V: Strategic perspectives in entrepreneurship

Strategic Planning-Strategic actions-strategic positioning-Business stabilization-Building the adaptive firms-understanding the growth stage-unique managerial concern of growing ventures.
Case: To Lease or Not: A Cash flow Question (David H.Holt, Page 452).

References:

1. Arya Kumar “Entrepreneurship- creating and leading an entrepreneurial org” Pearson 2012.
2. ‘Entrepreneurship: New Venture Creation’ David H Holt PHI, 2013.
3. Entrepreneurship: Text and Cases P. Narayana Reddy, Cengage, 2010.

PRINCIPLES OF EMBEDDED SYSTEMS
(Open Elective – III)

IV -B.Tech.-I-Sem **L T P C**
Subject Code: 17EC4104OE **3 - - 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12
CO1	outline the basic concepts of embedded **computing**	3	3	2	2
CO2	illustrate the architecture of 8051 microcontroller	3	3	3	2
CO3	develop embedded programs using 8051 microcontroller	3	3	3	2
CO4	demonstrate 8051 microcontroller interface with peripherals	3	3	3	2
CO5	explain real time operating system concepts	3	3	3	3

Unit-I

Embedded computing: Introduction, complex systems and microprocessor, the embedded system design process, formalisms for system design, design examples.

Unit-II

The 8051 architecture: Introduction, 8051 micro controller hardware, input / output ports and circuits, external memory, counter and timers, serial data input / output, interrupts.

Unit-III

Basic assembly language programming concepts: The assembly language programming process, programming tools and techniques, programming the 8051.
Instructions set: Data transfer and logical instructions, arithmetic operations, decimal arithmetic. Jump and call instructions.

Unit – IV

Applications: Interfacing with keyboards, displays, D/A and A/D conversions, multiple interrupts, serial data communication.

Unit – V

Introduction to real - time operating systems: Tasks and task states, tasks and data, semaphores, and shared data; message queues, mailboxes and pipes, timer functions, events, memory management, interrupt routines in an RTOS environment.

Textbooks:

1. Computers as Components - Principles of Embedded Computer System Design, Wayne Wolf, Elseveir.
2. The 8051 Microcontroller, Third Edition, Kenneth J.Ayala, Thomson.

References:

1. Microcontrollers, Raj kamal, Pearson Education.
2. An Embedded Software Primer, David E. Simon, Pearson Education.

WEB TECHNOLOGIES
(Open Elective – III)

IV – B.Tech. – I - Semester **L T P C**
Subject Code: 17CS4104OE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO6	PO12
CO1	design web pages using HTML and JavaScript	3	3	3	3	3
CO2	develop web applications using PHP	3	3	3	2	3
CO3	make use of XML and DTD for web design	3	3	3	2	2
CO4	build web applications using servlets and session tracking	3	3	3	2	2
CO5	establish database connectivity using JSP and JDBC	3	3	3	2	2

Unit-I

Web: Introduction, Internet and web, web browsers, web servers, protocols.
HTML: Basics, elements, attributes, tags- list, tables, images, forms, frames, cascading style sheets.
Java Script: Introduction to scripting, control structures, conditional statements, arrays, functions, objects.

Unit-II

PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls, handling file uploads, connecting to database, executing simple queries, handling sessions and cookies, file handling.

Unit-III

XML: Basics of XML, Elements, Attributes, Name space, **Parsing:** DOM and SAX Parsers.
Introduction to DTD: internal and external DTD, Elements of DTD, DTD Limitations, XML Schema, Schema structure, XHTML.

Unit-IV

Servlets: Introduction, Lifecycle, Generic and HTTP servlet, passing parameters to servlet, HTTP servlet Request & Response interfaces, Deploying web Applications,
Session Tracking: Hidden form fields, cookies, URL- Rewriting, session.

Unit-V

JSP: Introduction, Difference Between servlets & JSP, Anatomy of JSP page, JSP elements: Directives, comments, Expressions, scriptlets, Declaration, Implicit JSP objects, using Action elements.
JDBC: Introduction, JDBC Drivers, Loading Driver, establishing connection, Executing SQL statement in JSP pages, MVC architecture

Text Books:

1. Web Technologies, Uttam K Roy, Oxford University Press.
2. The Complete Reference PHP- Steven Hozner, TMH.

References:

1. Java Server Pages-Hans Bergsten, SPD O'Reilly.
2. JavaScript, D. Flanagan O'Reilly, SPD.
3. Beginning Web Programming-Jon Dckett WROX.

OPERATIONS RESEARCH
(Professional Elective-II)

IV-B.Tech-I-Sem **L T P C**
Subject Code: 17ME4105PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO3	PO12	PO14
CO1	formulate and solve LPP using various methods	3	3	3	3	3
CO2	solve transportation and assignment problems	3	3	3	3	3
CO3	compute sequencing and inventory model problems	3	3	3	3	3
CO4	analyze waiting lines and replacement problems	3	3	3	3	3
CO5	evaluate game theory and dynamic programming problems	3	3	3	2	3

Unit-I

Development – Definition- Characteristics and Phases - Types of models - Operations Research models - applications.
Linear Programming Problem Formulation - Graphical solution - Simplex method - Artificial variables techniques: Two-phase method, Big M method.

Unit-II

Transportation Problem: Formulation - Optimal solution, unbalanced transportation problem - Degeneracy. Assignment problem - Formulation - Optimal solution - Variants of Assignment Problem- Traveling Salesman problem.

Unit-III

Sequencing: Introduction - Flow -Shop sequencing - n jobs through two machines - n jobs through three machines - Job shop sequencing - two jobs through m machines.

Inventory: Introduction - Single item, Deterministic models - Purchase inventory models with one price break and multiple price breaks - Stochastic models - demand may be discrete variable or continuous variable - Single Period model and no setup cost.

Unit-IV

Waiting Lines: Introduction -Terminology-Single Channel - Poisson arrivals and Exponential Service times - with infinite population and finite population models- Multichannel - Poisson arrivals and exponential service times with infinite population.
Replacement: Introduction - Replacement of items that deteriorate with time - when money value is not counted and counted - Replacement of items that fail completely- Group Replacement.

Unit-V

Theory of Games: Introduction –Terminology- Solution of games with saddle points and without saddle points - 2 x 2 games - dominance principle - m x 2 & 2 x n games - graphical method.
Dynamic Programming: Introduction - Terminology - Bellman's Principle of Optimality - Applications of dynamic programming - shortest path problem - linear programming problem.

Textbooks:

1. Operations Research, J.K.Sharma 4th Edition, MacMilan.
2. Introduction to Operations Research, HilIier & Libermann, TMH.

References:

1. Introduction to Operations Research, Taha, PHl.
2. Operations Research, NVS Raju, SMS Education, 3rd Revised Edition.
3. Operations Research, A.M.Natarajan, P, Balasubramaniam, A Tamilarasi, Pearson.

POWER PLANT ENGINEERING
(Professional Elective-II)

IV-B.Tech-I-Sem **L T P C**
Subject Code: 17ME4106PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO6	PO12	PO14
CO1	illustrate energy sources, steam power plants and combustion process	3	2	2	3	3
CO2	explain the working principles of diesel and gas-turbine power plants	3	2	2	3	3
CO3	demonstrate hydro electric power plant with various layouts	3	3	2	3	3
CO4	outline the concepts of nuclear power plants	3	3	2	3	3
CO5	determine optimum parameters for power plants	3	3	2	3	3

Unit-I

Introduction to the Sources of Energy: Resources and Development of Power in India.

Steam Power Plant: Plant Layout, Working of different Circuits, Fuel and handling equipment, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems. **Combustion Process:** Properties of coal - overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and drought system, Fluidized Bed Combustion, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection.

Unit-II

Diesel Power Plant: Introduction - IC Engines, types, construction - Plant layout with auxiliaries - fuel supply system, engine starting equipment, lubrication and cooling system - super charging, Turbocharging.

Gas Turbine Plant: Introduction - classification - construction - Layout with auxiliaries - Principles of working of closed and open cycle gas turbines. Combined cycle power plants and comparison.

Unit-III

Hydro Electric Power Plant: Water power-Hydro logical cycle / flow measurement, Hydro graphs, storage and Poundage, classification of dams and spill ways.

Hydro Projects and Plant: Classification-Typical layouts, plant auxiliaries-plant operation pumped storage plants.

Unit-IV

Nuclear Power Station: Nuclear fuel-breeding and fertile materials -Nuclear reactor - reactor operation. Types of Reactors: Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding radioactive waste disposal.

Unit-V

Power Plant Economics and Environmental Considerations: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor -related exercises.

Textbooks:

1. A Text Book of Power Plant Engineering / Rajput / Laxmi Publications.
2. Power Plant Engineering! P.C.Sharma / S.K.Kataria Pub.
3. A Course in Power Plant Engineering: Arora and S. Domkundwar.

References:

1. Power Plant Engineering: P.K.Nag, 2nd Edition, TMH.
2. Power plant Engg, Elanchezhian, I.K. International Pub.

INDUSTRIAL ENGINEERING
(Professional Elective-II)

IV-B.Tech-I-Sem **L T P C**
Subject Code: 17ME4107PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO8	PO11	PO12
CO1	explain principles of industrial engineering and management	3	3	3	3	3
CO2	design various organizational structures	3	3	2	3	3
CO3	illustrate principles of operations management and line balancing	3	3	3	3	3
CO4	analyze the work study and establish limits using SQC	3	3	3	3	3
CO5	assess the methods of job evaluation and project management	3	3	3	3	3

Unit-I

Industrial Engineering: Introduction, Industrial Management, Entrepreneurship, organization – Importance of Management, Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

Unit-II

Designing Organizational Structures: Departmentization and Decentralization, Types of Organization structures – Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

Unit-III

Operations Management: Objectives- product design process- Process selection-Types of production system(Job, batch and Mass Production), Plant location-factors- Urban-Rural sites comparison- Types of Plant Layouts- Design of product layout.
Line balancing (RPW method) Value analysis-Definition-types of values- Objectives- Phases of value analysis- Fast diagram.

Unit-IV

Work Study: Introduction - definition - objectives - steps followed in work study - Method study - definition - objectives - steps of method study. Work Measurement - purpose - types of study - stop watch methods - steps - key rating - allowances - standard time calculations - work sampling. **Statistical Quality Control:** variables-attributes, Shewart control charts for variables- chart, R chart, - Attributes-Defective-Defect- Charts for attributes-p-chart -c chart (simple Problems). Acceptance Sampling- Single sampling- Double sampling plans-OC curves.

Unit-V

Job Evaluation: Methods of job evaluation - simple routing objective systems - classification method - factor comparison method - point method - benefits of job evaluation and limitations. **Project Management:** Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems)

Textbooks:

1. Industrial Engineering and Management, O.P. Khanna, Khanna Publishers.
2. Industrial Engineering and Management Science, T.R. Banga and S.C.Sarma, Khanna Publishers.

References:

1. Production & Operation Management, Paneer Selvam, PHI.

2. Industrial Engineering Management, NVS Raju, Cengage Learning.

UNCONVENTIONAL MACHINING PROCESSES
(Professional Elective-II)

IV-B.Tech-I-Sem **L T P C**
Subject Code: 17ME4108PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO12	PO14
CO1	explain modern machining processes and principles of USM	3	3	3	3	3
CO2	outline working principles of AJM, WJM and AWJM techniques	3	3	3	3	3
CO3	demonstrate working principles of EDM, EDG and EDW	3	3	3	3	3
CO4	illustrate working principles of EBM, LBM and PAM processes	3	3	3	3	3
CO5	adapt working principles of CM and ECM processes	3	3	3	3	3

Unit-I

Introduction: Need for non-traditional machining methods-Classification of modern machining processes –considerations in process selection, Materials, Applications.

Ultrasonic machining: Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent development.

Unit-II

Abrasive jet machining, Water jet machining and abrasive water jet machine: Basic principles, equipments, process variables, mechanics of metal removal, MRR, application and limitations. Magnetic abrasive finishing, Abrasive flow finishing

Unit-III

General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes –Power circuits for EDM, Mechanics of metal removal in EDM.

Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection. Wire EDM, principle, applications.

Unit-IV

Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes –General Principle and application of laser beam machining –thermal features, cutting speed and accuracy of cut. Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.

Unit-V

Fundamentals of electrochemical machining, electrochemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy economic aspects of ECM –Simple problems for estimation of metal removal rate. Fundamentals of chemical machining, Chemical machining principle, maskants, etchants, advantages and applications of chemical machining. Metal removal rate, Electro stream drilling, Shaped tube electrolytic machining.

Textbooks:

1. Advanced machining processes by VK Jain, Allied publishers.

References:

1. Modern Machining Process, Pandey P.C. and Shah H.S., TMH.
2. New Technology, Bhattacharya A, The Institution of Engineers, India 1984.

CAD/CAM LAB

IV-B.Tech-I-Sem **L T P C**
Subject Code: 17ME4109PC **0 0 3 2**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO4	PO5	PO10	PO14
CO1	construct geometric models using CAD packages	3	3	3	3
CO2	analyze the stress distribution in structures using FEA packages	3	3	3	3
CO3	evauate thermal gradients using FEA packages	3	3	3	3
CO4	develop part programming for various contours	3	3	3	3
CO5	adapt CNC technology for manufacturing simple components	3	3	3	3

List of Experiments (Any 08 of the following):

1. DRAFTING: Development of part drawing for various components in the form of orthographic and isometric views. Representation of dimensions
2. PART MODELING: Generation of various 3D models through protrusion, revolve and sweep.Creation of various features. Study of parent child relation Feature based, Boolean based and assembly modeling. Design of simple components
3. Determination of the deflection and stresses in 2D trusses and 2D beams.
4. Determination of deflections, principal and Von-Mises stresses in plane stress, plane strain.
5. Determination of stresses in 3D shell structures.
6. Harmonic response of 2D beams.
7. Steady State heat transfer analyses of plane.
8. Development of the process sheet for various components based on tooling and machines.
9. Development of manufacturing defects and tool management systems.
10. Study of various post processor used in NC machines.
11. Development of NC codes for free form and sculptured surfaces using CAM software.
12. Machining of simple components on NC lathe and Mill by transferring NC Code/from CAM software

INSTRUMENTATION AND CONTROL SYSTEMS LAB

IV-B.Tech - I- Sem **L T P C**
Subject Code: 17ME4110PC **0 0 3 2**

Pre-requisites: Basic principles of Instrumentation and control systems

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO3	PO4	PO5
CO1	calibrate the measuring devices	3	3	3
CO2	demonstrate pressure, displacement and vibration measuring devices	3	3	3
CO3	analyze the temperature measuring devices	3	3	3
CO4	determine the speed using photo and magnetic speed pickups	3	3	3
CO5	perform and calibrate rotameter for flow measurement	3	3	3

List of experiments:

1. Calibration of Pressure Gauges
2. Calibration of transducer for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Calibration of strain gauge for temperature measurement.
5. Calibration of thermocouple for temperature measurement.
6. Calibration of capacitive transducer for angular displacement.
7. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
8. Calibration of resistance temperature detector for temperature measurement.
9. Study and calibration of a rotameter for flow measurement.
10. Study and use of a seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
11. Study and calibration of Mcleod gauge for low pressure.

FOREIGN LANGUAGE: FRENCH
MANDATORY COURSE (NON-CREDIT)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: 17HS4112MC **3 0 0 0**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO9	PO10
CO1	identify the basic structure of French language, spelling and pronunciation	3	3
CO2	reproduce the grammatical structure for basic communication	3	3
CO3	recognize and use the grammatical structures for general comprehension	3	3
CO4	use the grammatical and lexical notions in formal and informal situations	3	3
CO5	apply the language skills in communicating effectively at a global platform	3	3

Unit-I: Introduction

At the airport: Savoir– faire: exchanging greetings, self introduction, introducing another, welcoming someone, identifying someone - Grammar: verbs _to be', _to call oneself', subject pronouns, interrogation.

Unit-II: Grammar

At the University: Savoir-faire: enquiring after one's welfare, taking leave, expressing appreciation - Grammar: definite & indefinite articles, gender of nouns, adjectives, present tense of regular verbs, to have, to learn, negation, irregular verbs

Unit-III: Conversation

At the café: Savoir –faire: speaking about one's likes, giving information, expressing admiration, asking information about someone - Grammar: Interrogative adjectives, irregular verbs, possessive and interrogative adjectives

Unit-IV: Proposal Writing & Formal Letters

At the beach: Savoir faire: proposing an outing, accepting/ refusing the proposal - Grammar: singular & plural, indefinite pronoun, demonstrative adjectives, negation, irregular verbs
A concert: Savoir –faire: inviting, accepting, expressing one's inability to accept an invitation

Unit- V: Regular & Irregular Verbs

Grammar: Present tense of more irregular verbs, contracted articles, future tense, interrogative adverbs, At Nalli's Savoir- faire: asking the price of an article, protesting against the price, Grammar: possessive adjectives, Exclamative adjectives, imperative tense

Reference:

1. Course Material: Synchronie I –Méthode de Français, Madanagobalane -Samita Publications, Chennai, 2007

FOREIGN LANGUAGE: GERMAN
MANDATORY COURSE (NON-CREDIT)

IV-B.Tech.-I-Sem. **L T P C**
Subject Code: 17HS4113MC **3 0 0 0**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO9	PO10
CO1	identify the basic structure of German language, spelling and pronunciation	3	3
CO2	reproduce the grammatical structure for self introduction	3	3
CO3	recognize and use the grammatical article structures for basic conversation	3	3
CO4	use the grammatical and verb structure for formal and informal situations	3	3
CO5	apply the language skills in communicating effectively at a global platform	3	3

Course structure:

A. German Language (speaking, reading, writing, grammar and test)
B. Life in Germany (shopping, restaurant, doctor, government, bank, post)
C. The German Way (introduction, doing business, conversation, meetings, dining)
D. Germany (Culture, Climate)

Unit-I: Pronounciation

Welcome: Introduction to the Language, Spelling and Pronunciation (The alphabets and numbers) Greetings, ordering, requesting, saying thank you - Grammar **– the article "the", conjugation** of verbs

Unit-II: Self Introduction

Shopping - Grammar – adjectives, endings before nouns, practice. Self introduction

Unit-III: Training

Addresses, Occupations, Studies – Grammar - **„to be', the definite/indefinite** articles, individual Training

Unit-IV: Oral

Leisure Time, Sports, Hobbies - Grammar – position of a verb in a main clause , oral practice

Unit-V: Narration

At a Restaurant, Food and Drink - Grammar – the personal pronoun in the Nominative and Accusative, Narrating an event

Resources:

1. Sprachkurs Deutsch 1 (Verlag Diesterweg), New Delhi Learning Centre

IV-B.TECH.-II-SEMESTER SYLLABUS

ROBOTICS

IV-B.Tech-II-Sem **L T P C**
Subject Code: 17ME4201PC **4 1 0 4**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO1	PO2	PO12	PO14
CO1	select suitable end effectors for industrial automation	3	3	3	3
CO2	perform kinematic analysis on end-effector positioning	3	3	3	3
CO3	estimate forces using dynamic formulation	3	3	3	3
CO4	plan path of the end effector using feedback components	3	3	3	3
CO5	apply the robot technologies in various industrial applications	3	3	3	3

Unit – I:
Introduction: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics. Components of the Industrial Robotics: End effectors, Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, Adhesive Grippers and Tools. Number of degrees of freedom – Basic classification of industrial robots based on DOF. General Consideration on gripper selection and design

Unit – II:
Motion Analysis: Basic Rotation Matrices, Equivalent Axis and Angle, Euler Angles, Composite Rotation Matrices. Homogeneous transformations as applicable to rotation and translation – problems
Manipulator Kinematics-DH notation, DH method of Assignment of frames- Link Transformation Matrix, Manipulator Transformation Matrix, joint coordinates and world coordinates, Forward and inverse kinematics – problems on Industrial Robotic Manipulation.

Unit – III:
Differential Kinematics: Differential kinematics of planar and spherical manipulators, Jacobians – problems**.**
Dynamics: Lagrange – Euler formulation, Newton – Euler formations – Problems on planar two link manipulators.

Unit IV:
Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint interpolated motion – straight line motion. Cubic polynomial fit.
Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors, comparison of Actuators, Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors, Tactile and Range sensors, Force and Torque sensors.

Unit V:
Robot Application in Manufacturing: Material Transfer – Material handling, loading and unloading- Processing – spot and continuous arc welding & spray painting – Assembly and Inspection.

Text Books:
1. Industrial Robotics / Groover M P /Mc Graw Hill
2. Robotics / Fu K S / McGraw Hill

Reference Books:
1. Robot Dynamics and Controls / Spony and Vidyasagar / John Wiley
2. Robot Analysis and control / Asada , Slotine / Wiley Inter-Science
3. Robotics and Control / Mittal R K & Nagrath / TMH

RENEWABLE ENERGY SYSTEMS
(Professional Elective-III)

IV-B.Tech-II-Sem **L T P C**
Subject Code: 17ME4202PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO6	PO7	PO12	PO14
CO1	analyze global and national energy scenarios	3	3	3	3	3
CO2	illustrate the various solar energy systems	3	3	3	3	3
CO3	demonstrate the aspects related to wind energy power plants	3	3	3	3	3
CO4	build the power plants using bio gas	3	3	3	3	3
CO5	estimate the power generation in hydroelectric plants	3	3	3	3	3

Unit I

Introduction-Principles of solar radiation: Energy Sources, Classification of Energy Sources (Renewable and Non Renewable) Energy need and energy consumption of India, Role and potential of the renewable source, the solar energy option, Environmental impact of solar power-Physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, Solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, solar radiation data.

Unit II

Solar energy collection-Solar energy storage and Applications: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advances collectors.Different methods, sensible, latent heat and stratified storage, solar ponds.Solar application, solar heating/cooling techniques, solar distillation and drying,*Photovoltaic energy conversion*

Unit III

Wind energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics. **Bio-mass:** Principles of Bio conversion, Anaerobic/aerobic digestion, types of Bio gas digesters, gas yield *Combustion characteristics of bio gas utilization for cooking.*

Unit IV

Geothermal energy: Resources, types of wells, methods of harnessing the energy, potential in India
O T E C: Principles, utilization, setting of OTEC plants, thermodynamics cycles, Tidal: Potential and conversion techniques,*Wave energy*

Unit V

Direct energy conversion: Need for DEC, principles of DEC. Thermo electric generators, seebeck, Peltier and Joule Thompson effects, figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, electron gas dynamic conversion, economic aspects.principle. Faraday's laws, thermodynamics aspects Selection of fuels and operating conditions

Textbook (s)

1. G.D. Rai, Non- conventional Energy Sources, Khanna Publications, 2005
2. Ashok V Desai, Non-Conventional Energy, Wiley Eastern Limited, 2003
3. Km Mittal , Non-conventional energy Systems, Wheeler publishing co. limited, 2003
4. Ramesh and Kumar, Renewable Energy Technologies, Narosa Publishing compay, 2003

Reference (s)

1. J Twidell & T Weir, Renewable Energy Sources, 2nd Ed., Taylor & Francis publishers, 2006
2. Sukhame and JK Nayak, Solar Energy, 3rd Edition, TMH, 1996
3. B.S. Magal Franck Kreith and J.F Kreith , Solar Power Engineering, 2015

MACHINE TOOL DESIGN
(Professional Elective-III)

IV-B.Tech-II-Sem **L T P C**
Subject Code: 17ME4203PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO4	PO5	PO12	PO13	PO14
CO1	synthesize of machine tool mechanisms	3	3	3	3	3	3	3
CO2	select speed ranges in machine drives	3	3	3	3	3	3	3
CO3	design feed gear boxes	3	3	3	3	3	3	3
CO4	summarize about spindles of various machine tools	3	3	3	3	3	3	3
CO5	classify various controls used in machine tools	3	3	3	3	3	3	3

Unit-I

Introduction: Classification of machine tools Mechanisms used for converting rotary to linear motion and intermittent motion - Kinematic structures of machine tools - general purpose, special purpose, automatic screw cutting machines - Basic features of transfer machines - Numerical Control of machine tools, advantages and limitations Schematic diagrams of NC systems.

Unit-II

Drives of machine tools; selection of range of speeds and feeds Speed layout in GP, AP and logarithmic progression - Standardization of speeds and feeds - Productivity loss

Selection of highest and lowest speeds, range ratio - Design of ray diagram and structural diagrams for machine tool gear boxes - Determination of number of teeth and module of gears in gear box design - Rules for layout of gear box having sliding clusters. Sliding cluster and clutched drives, Ruppert drive.

Unit-III

Feed gear boxes: Norton and Meander gear boxes. Stepped and step less regulation of speeds.
Strength and Rigidity design analysis. Design of beds, frames, Columns and Guide ways
Materials for structures - Methods to improve the rigidity of structures - Overall compliance of machine tool - Thermal effects - functional accuracy of machine tool

Unit-IV

Spindle units; Spindles of lathe, Drilling, Milling and grinding machines materials for spindles - Spindle design. Effect of clearance on the rigidity of spindle
Hydro-dynamic and Hydro-static bearings; Requirements of spindle bearings

Unit-V

Various controls used in machine tools. Hydraulic and Pneumatic systems used in machine tools. Positive displacement pumps. Power pack. Relief valves, check valves, flow control valves, multi position direction control valves, Filters, Accumulators. Speed regulation of surface grinding machine. Hydro- copying systems.

Text Books:

1. G C Sen & Bhattacharya, Principles of machine tools, New Central Book Agency, Calcutta.
2. N K Mehta, Machine Tool Design and Numerical Control, Tata McGraw-Hill Publishing co. Ltd.

References

1. S.K.Basu, Design of machine tools, Allied Publishers
2. S R Majumdar, Hydraulic Systems- Principles & Maintenance, Tata Mc.Graw-Hill Publishing Company Limited; New Delhi

NEURAL NETWORKS AND FUZZY LOGICS
(Professional Elective-III)

IV-B.Tech-II-Sem **L T P C**
Subject Code: 17ME4204PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO4	PO5	PO12	PO13	PO14
CO1	summarize characteristics and applications of ANN	3	3	3	3	3	3	3
CO2	illustrate perceptron models, networks and training algorithms	3	3	3	3	3	3	3
CO3	make use of various associative memories	3	3	3	3	3	3	3
CO4	analyze hopfield networks	3	3	3	3	3	3	3
CO5	explain various concepts of fuzzy logics	3	3	3	3	3	3	3

Unit-I

Introduction & Essentials to Neural Networks: Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCullochP iUs Model, Historical Developments, Potential Applications of ANN. Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN — Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application

Unit—II

Single & Multi Layer Feed Forward Neural Networks : Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training

Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications. Credit Assignment Problem, Generalized Delta Rule, and Derivation of Back-propagation (BP) Training, Summary of Back-propagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements

Unit-III

Associative Memories-I: Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory).

Unit-IV

Associative Memories-II: Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem. Architecture of Hoptield

Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network Summary and Discussion of Instance/Memory Based Learning Algorithms, Applications.

Unit – V

Fuzzy Logic: Classical & Fuzzy Sets: Introduction to classical sets – properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

Fuzzy Logic System Components: Fuzzification, Membership value assignment, development of rule base and decision making system, Def uzzification to crisp sets, De—fuzzification methods.

Text Books

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications, Rajasekharan and Pal, PHI.
2. Neural Networks and Fuzzy Logic, C. Naga Bhaskar, G. Vijay Kumar, BS Publicatior-is.

Reference Books

1. Artificial Neural Networks, B. Yegnanarayana, PHI.
2. Artificial Neural Networks, Zaruda, PHI.

PRODUCTION PLANNING AND CONTROL
(Professional Elective-III)

IV-B.Tech-II-Sem **L T P C**
Subject Code: 17ME4205PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO11	PO12	PO14
CO1	illustrate the functions of PPC	3	3	2	3	3
CO2	outline the principles and types of forecasting	3	3	2	3	3
CO3	differentiate various inventory control techniques	3	3	3	3	3
CO4	solve routing and scheduling problems	3	3	3	3	3
CO5	summarize dispatching process	3	3	3	3	3

Unit-I

Introduction: Definitions: PPC - Objectives and applications of production planning and control, Functions of production planning and control, elements of production planning and control- Types of productions: job, batch and mass production- Organizations of production planning and control — internal organizations and departments- Marketing aspect.

Unit-II

Forecasting: Introduction, Importance and General Principles of forecasting -Types of forecasting techniques: Qualitative methods, quantitative methods, Long term and Short term sales forecasting methods Applications of forecasting.

Unit-III

Inventory management: Introduction- Functions of inventory control-ABC analysis- VED Analysis-EOQ technique.
Models of Inventory control systems: P-Systems and Q-Systems -Introduction to MRP And ERP, LOB(Line of balance), JIT inventory, Japanese concepts.

Unit-IV

Routing: Definition - routing procedure- Route sheets - Bill of material- factors affecting routing procedure. Schedule - definition - difference with loading -Scheduling policies - techniques, standard scheduling methods- job shop, flow shop- Line balancing, aggregate planning- methods for aggregate planning- Purchase planning, expediting, control aspects.

Unit-V

Dispatching: Dispatching procedure, follow up - definition - functions - types of follow up and their functions, applications of computer in production planning and control.

Textbooks:

1. Production Planning and Control! M.Mahajan, Dhanpatirai & Co.
2. Production Planning and Control, Jam & Jam, Khanna publications.

References:

1. Production Planning and Control, Text & cases, SK Mukhopadhyaya, PHI.
2. Production and operations Management U R.Panneer Selvam, PHI.
3. Production and Operations Management (Theory and Practice), Dipak.

FLUID POWER SYSTEMS
(Professional Elective-IV)

IV-B.Tech-II-Sem **L T P C**
Subject Code: 17ME4206PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO4	PO12	PO13
CO1	classify components of hydraulic systems	3	3	3	3	3
CO2	compare components of pneumatic systems	3	3	3	3	3
CO3	design fluid power circuits for industrial applications	3	3	3	3	3
CO4	build electro fluid power circuits	3	3	3	3	3
CO5	develop fluid power circuits for industrial automation	3	3	3	3	3

Unit 1
Hydraulic Components: Introduction to fluid power system-Pascal's Law-Hydraulic fluids-Hydraulic pumps-Gear, Vane and Piston pumps-Pump Performance-Characteristics and Selection-actuators-valves-pressure control-flow control and direction control valves-Hydraulic accessories-Hydraulic Accumulator.

Unit 2
Pneumatic Components: Introduction to Pneumatics-Compressors-types-Air treatment-FRL unit-Air dryer-Control valves-Logic valves-Time delay valve and quick exhaust valve-Pneumatic Sensors–types-characteristics and applications

Unit 3
Fluid Power Circuits: Circuit Design Methodology-Sequencing circuits-Overlapping signals-Cascade method-KV Map method-Industrial Hydraulic circuits-Double pump circuits-Speed control Circuits-Regenerative circuits-Safety circuits-Synchronizing circuits-Accumulator circuits

Unit 4
Electro - Pnuematics and Hydraulics: Relay, Switches-Solenoid-Solenoid operated valves-Timer-Counter-Servo and proportional control-Microcontroller and PLC based control-Design of electro-pneumatic and hydraulic circuits.

Unit 5
Application, Maintenance and Trouble Shooting: Development of hydraulic / pneumatic circuits applied to machine tools-Presses-Material handling systems-Automotive systems-Packaging industries-Manufacturing automation-Maintenance and trouble shooting of Fluid Power circuits-Safety aspects involved.

Text Books
1. Anthony "Esposito, Fluid Power with applications", Prentice Hall international–1997.
2. Majumdar.S.R, "Oil Hydraulics", Tata McGraw Hill, 2002.
3. Majumdar S.R, "Pneumatic systems-principles and maintenance", Tata McGraw Hill 1995.
4. Werner Deppert, "Kurt Stoll, Pneumatic Application", Vogel verlag–1986.

References
1. John Pippenger, Tyler "Hicks, Industrial Hydraulics", McGraw Hill International Edition, 1980.
2. Andrew Parr, "Hydraulics and pneumatics", Jaico Publishing House, 2003.
3. FESTO, "Fundamentals of Pneumatics", Vol I, II, III.

COMPUTATIONAL FLUID DYNAMICS
(Professional Elective-IV)

IV-B.Tech-II-Sem **L T P C**
Subject Code: 17ME4207PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO12	PO13
CO1	distinguish various numerical methods used in CFD	3	3	3	3	3
CO2	explain the basic rules of FVM	3	3	3	3	3
CO3	apply FVM to solve convection and diffusion problems	3	3	3	3	3
CO4	solve flow field problems using CFD	3	3	3	3	3
CO5	analyze turbulent flows by applying CFD concepts	3	3	3	3	3

Unit-I

Introduction to Numerical Methods: Finite Difference, Finite element and finite volume methods - classification of partial differential equations – solution of linear algebraic equations – direct and iterative approaches.
Finite difference methods: Taylor's series – FDE formulation for 1D and 2D steady state heat transfer problems – Cartesian, cylindrical and spherical co-ordinate systems – boundary conditions – Un-steady state heat conduction – Errors associated with FDE – Explicit Method – Stability criteria – Implicit Method – Crank Nickolson method – 2-D FDE formulation – ADI – ADE

Unit-II

Finite Volume Method: Formation of Basic rules for control volume approach using 1D steady heat conduction equation – Interface Thermal Conductivity – Extension of General Nodal Equation to 2D and 3D Steady heat conduction and unsteady heat conduction.

Unit-III

FVM to Convection and Diffusion: Concept of Elliptic, Parabolic and Hyperbolic Equations applied to fluid flow – Governing Equations of Flow and Heat transfer.

Steady 1D Convection Diffusion – Discretization Schemes and their assessment – Treatment of Boundary Conditions.

Unit-IV

Calculation of Flow Field: Vorticity & Stream Function Method – Staggered Grid as Remedy for representation of Flow Field – Pressure and Velocity Corrections – Pressure Velocity Coupling – SIMPLE & SIMPLER (revised algorithm) Algorithm.

Unit-V

Turbulent Flows: Direct Numerical Simulation, Large Eddy Simulation and RANS Models Compressible Flows: Introduction – Pressure, Velocity and Density Coupling.

Textbooks:

1. Numerical heat transfer and fluid flow – S.V. Patankar (Hemisphere Pub. House)
2. An Introduction to Computational Fluid Dynamics – FVM Method – H.K. Versteeg, & Co., PHI.

References:

1. Computational Fluid Dynamics – Hoffman and Chiang, Engg Education System.
2. Computational Fluid Dynamics – Anderson (TMH).

FLEXIBLE MANUFACTURING SYSTEMS
(Professional Elective-IV)

IV-B.Tech.-II-Sem **L T P C**
Subject Code: 17ME4208PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO12	PO14
CO1	explain the concepts of FMS	3	3	3	3
CO2	make use of automated material handling systems	3	3	3	3
CO3	perform engineering analysis of ASRS	3	3	3	3
CO4	identify bottlenecks in FMS operational issues	3	3	3	3
CO5	summarize the concepts of JIT and lean manufacturing	3	3	3	3

Unit-I

Introduction: Flexibility – Types of FMS – FMS components: Workstations, Material Handling and Storage Systems – Computer Control Systems – Human Resources – FMS Applications and Benefits.

Unit-II

Automated Material Handling Systems: Design Considerations in Material handling – Material Handling Equipment – Industrial Trucks, Automated Guided Vehicles, Monorails and Other Rail-Guided Vehicles –Analysis of Material Transport System.

Unit-III

Part A: Storage Systems in FMS: Storage Systems Performance and Location Strategies – Automated Storage/Retrieval Systems – Carousel Storage Systems.

Part B: Engineering Analysis of Automated Storage/Retrieval Systems – Carousel Storage Systems.

Unit-IV

FMS Planning and Implementation: FMS Planning and Implementation issues- Quantitative Analysis of FMS – Bottleneck Model –FMS Operational Parameters – Simple Problem – Extended Bottleneck Model – Sizing of FMS.

Unit-V

Just-In-Time and Lean Production: Lean Production and Waste in Manufacturing - Just-In-Time Production Systems – Pull System of Production Control – Setup Time Reduction – Stable and Reliable Operations – Autonomation – Worker Involvement – Visual Management and 5S.

Textbooks:

1. Automation, Production Systems, and Computer Integrated Manufacturing, Mikell P.Groover, PHI.
2. Hand Book of Flexible Manufacturing Systems, Jha N K, Academic Press.

References:

1. Flexible Manufacturing Systems, H K Shivanand, New Age International, 2006.
2. Flexible Manufacturing Cells & Systems - William W. Luggen –Prentice hall, NJ.

ADVANCED MECHANICS OF SOLIDS
(Professional Elective-IV)

IV-B.Tech-II-Sem **L T P C**
Subject Code: 17ME4209PE **3 0 0 3**

Course Outcomes (COs) & CO-PO Mapping (3-Strong; 2-Medium; 1-Weak Correlation)

COs	Upon completion of course the students will be able to	PO2	PO3	PO5	PO12	PO13
CO1	apply concepts of stress and strain analyses in solids	3	3	3	3	3
CO2	solve the constitutive equations of bending of cantilever beams	3	3	3	3	3
CO3	assess stress concentration using stress functions	3	3	3	3	3
CO4	solve unsymmetric bending problems	3	3	3	3	3
CO5	determine defelctions and deformations using energy methods	3	3	3	3	3

UNIT I

Introduction to stress analysis in elastic solids - stress at a point – stress tensor – stress components in rectangular and polar coordinate systems - Cauchy's equations – stress transformation – principal stresses and planes - hydrostatic and deviatoric stress components, octahedral shear stress - equations of equilibrium. Displacement field – engineering strain - strain tensor (basics only) – analogy between stress and strain tensors - strain-displacement relations (small-strain only) – compatibility conditions

UNIT II

Constitutive equations – generalized Hooke's law – equations for linear elastic isotropic solids - relation among elastic constants – Boundary conditions – St. Venant's principle for end effects – uniqueness theorem 4, 2-D problems in elasticity - Plane stress and plane strain problems – 15% stress compatibility equation - Airy's stress function and equation – polynomial method of solution – solution for bending of a cantilever with an end load

UNIT III

Equations in polar coordinates (2D) – equilibrium equations, strain displacement relations, Airy's equation, stress function and stress components (only short derivations for examination)
Application of stress function to Lame's problem and stress concentration problem of a small hole in a large plate (only stress distribution)
Axisymmetric problems – governing equations – application to thick cylinders,, rotating discs.

UNIT IV

Unsymmetrical bending of straight beams (problems having c/s with one axis of symmetry only) – curved beams (rectangular c/s only) – shear center of thin walled open sections (c/s with one axis of symmetry only). Strain energy of deformation – special cases of a body subjected to 15% concentrated loads, moment or torque - reciprocal relation – strain energy of a bar subjected to axial force, shear force, bending moment and torque

UNIT V

Maxwell reciprocal theorem – Castiglione's first and second theorems – virtual work principle – minimum potential energy theorem. Torsion of non-circular bars: Saint Venant's theory - solutions for circular and elliptical cross-sections

Text Books:

1. L. S. Sreenath, Advanced Mechanics of Solids, McGraw Hill,2008
2. S. M. A. Kazimi, Solid Mechanics, McGraw Hill,2008
3. S. Jose, Advanced Mechanics of Materials, Pentagon Educational Services,2013

References Books:

1. S. P. Timoshenko, J. N. Goodier, Theory of elasticity, McGraw Hill,1970
2. R.J. Atkin, and N. Fox, An introduction the theory of elasticity, Longman,1980