

## CMR COLLEGE OF ENGINEERING& TECHNOLOGY (UGC Autonomous)

Kandlakoya, Medchal Road, Hyderabad – 501 401 ACADEMIC REGULATIONS - R 22

# FOR CBCS & OUTCOME BASED B.TECH ( REGULAR, HONOURS and MINOR) PROGRAMMES

(Effective for the students admitted into I year from the Academic Year 2022-23)

## 1.0 <u>Under-Graduate Degree Programme in Engineering & Technology (UGP in E&T)</u>

CMR College of Engineering & Technology, Hyderabad offers 4 Years (8 Semesters) Bachelor of Technology (B.Tech.) Regular, Honours and Minor degree Programmes, under Choice Based Credit System (CBCS), with effect from the Academic Year 2022-23 and onwards, in the Branches of Engineering.

## 2.0 Eligibility for Admission

- **2.1** Admissions will be done as per the norms prescribed by the Government of Telangana. The Government orders in vogue shall prevail.
- **2.2** The candidate should have passed the qualifying examination Intermediate or equivalent on the date of admission.
- 2.3 Seats in each program in the college are classified into Category–A (70% of intake) and Category-B (30% of intake) besides Lateral Entry. Category-A seats will be filled by the Convener, TSEAMCET Admissions. Category-B seats will be filled by the College as per the guidelines of the Competent Authority.
- 2.4 Lateral Entry seats for 10% of the candidates from the approved strength of the course shall be admitted into the III Semester directly based on the rank secured by the candidate in TSECET in accordance with the guidelines from the Competent Authority.
- 2.5 The medium of instructions for the entire undergraduate programme in Engineering & Technology will be **English** only

## 3.0 B.Tech. Programme Structure

- 3.1 A student after securing admission shall complete the B.Tech. programme in a 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 student shall forfeit seat in B.Tech course. Each student shall secure 160 credits (with CGPA  $\geq$  5) required for the completion of the undergraduate programme and award of the B.Tech. degree.
- **3.2** UGC/ AICTE specified definitions/ descriptions are adopted appropriately for various terms and abbreviations used in these academic regulations/ norms, which are listed below.

## 3.2.1 Semester Scheme

Each undergraduate programme is of 4 academic years (8 semesters) with the academic year divided into two semesters (First/Odd and Second/Even). Each Semester shall have a minimum of 90 Instructional Days.

semester - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)' under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) indicated by UGC, and curriculum/course structure suggested by AICTE are followed.

## 3.2.2 Credit Courses

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

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

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

## 3.2.3 Subject Course Classification

All subjects/ courses offered for the undergraduate programme in E&T (B.Tech. degree programmes) are broadly classified as follows. The University has followed almost all the guidelines issued by AICTE/UGC.

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1		BSC – Basic Sciences	Includes Mathematics, Physics and Chemistry subjects
2	Foundation Courses	ESC - Engineering Sciences	Includes Fundamental Engineering Subjects
3	(FnC)	HSMC – Humanities andSocial Sciences	Includes subjects related to Humanities, Social Sciences and Management
4	Core Courses (CoC)	PCC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.
5	Flective	PEC – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
6	Courses (E&C)	OEC – Open Electives	Elective subjects which include inter- disciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering.

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7		Project Work	B.Tech. Project or UG Project or UG Major Project or Project Stage I & II
8	Core Courses (PROJ)	Industry Training/ Internship/ Mini- project/ Mini- Project/ Skill Development	Industry Training/ Internship/ Mini-Project/ Mini-Project/ Skill DevelopmentCourses
		Courses	
9		Seminar	Seminar/ Colloquium based on core contents related to parent discipline/ department/ branch of Engineering.
10	Minor Courses	-	1 or 2 Credit Courses (subset of HSMC)
11	Mandatory Courses (MC)	-	Mandatory Courses (non-credit)

## 4.0 Course Registration

- **4.1** A 'faculty advisor or counselor' shall be assigned to a group of 20 students, who will advise the students about the undergraduate programme, its course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.
- **4.2** The academic section of the college invites 'registration forms' from students before the beginning of the semester through 'on-line registration', ensuring 'date and time stamping'. The 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 **on-line** registration, **only after** obtaining the '**written approval**' from faculty advisor/counselor, which should be submitted to the college academic section through the Head of the Department. A copy of it shall be retained with the Head of the Department, Faculty Advisor/ Counselor and the student.
- **4.4** A student may be permitted to register for all the subjects/ courses in a semester as specified in the course structure with maximum additional subject(s)/course(s) limited to 6 Credits (any 2 elective subjects), based on **progress** and SGPA/ CGPA, and completion of the '**pre-requisites'** as indicated for various subjects/ courses, in the department course structure and syllabus contents.
- **4.5** Choice for 'additional subjects/courses', not more than any 2 elective subjects in any Semester, must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/Mentor/HOD.
- **4.6** If the student submits ambiguous choices or multiple options or erroneous entries during **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 **on-line** registration are final and **cannot** be changed or inter-changed; further, alternate choices also will not be considered.

However, if the subject/ course that has already been listed for registration by the Head of the Department in a semester could not be offered due to any inevitable or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within **a week** after the commencement of class-work for that semester.

- **4.8** Dropping of subjects/ courses may be permitted, only after obtaining prior approval from the faculty advisor/ counselor 'within a period of 15 days' from the beginning of the current semester.
- **4.9 Open Electives**: The students have to choose three Open Electives (OE-I, II & III) from the list of Open Electives given by other departments. However, the student can opt for an Open Elective subject offered by his own (parent) department, if the student has not registered and not studied that subject under any category (Professional Core, Professional Electives, Mandatory Courses etc.) offered by parent department in any semester. Open Elective subjects already studied should not repeat/should not match with any category (Professional Core, Professional Electives, Mandatory Courses etc.) of subjects even in the forthcoming semesters.
- **4.10 Professional Electives**: The students have to choose six Professional Electives (PE-I to VI) from the list of professional electives given.

## 5.0 Subjects/ courses to be offered

- **5.1** A subject/ course may be offered to the students, **only if** a minimum of 15 students opt for it.
- 5.2 More than **one faculty member** may offer the **same subject** (lab/ practical may be included with the corresponding theory subject in the same semester) in any semester. However, selection of choice for students will be based on 'first come first serve basis and CGPA criterion' (i.e. the first focus shall be on early **on-line entry** from the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student).
- **5.3** If more entries for registration of a subject come into picture, then the Head of the Department concerned shall decide, whether or not to offer such a subject/ course for **two (or multiple) sections**.
- 5.4 In case of options coming from students of other departments/ branches/ disciplines (not considering open electives), first priority shall be given to the student of the 'parent department'.

## 6.0 Attendance requirements:

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

semester. Two periods of attendance for each theory subject shall be considered, if the student appears for the mid-term examination of that subject. For Mandatory Course the Student has to acquire minimum attendance of 75% for securing satisfactory result. The student who fails to acquire minimum attendance of 75% has to re-register for the same as and when offered in subsequent semesters.

- **6.2** Shortage of attendance in aggregate upto 10% (65% and above, and below 75%) in each semester may be condoned by the college academic committee on genuine and valid grounds, based on the student's representation with supporting evidence.
- 6.3 A stipulated fee shall be payable for condoning of shortage of attendance.
- 6.4 Shortage of attendance below 65% in aggregate shall in NO case be condoned.
- 6.5 Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examinations of that semester. They get detained and their registration for that semester shall stand cancelled, including all academic credentials (internal marks etc.) of that semester. They will not be promoted to the next semester. They may seek re-registration for all those subjects registered in that semester in which the student is detained, by seeking re-admission into that semester as and when offered; if there are any professional electives and/ or open electives, the same may also be re-registered if offered. However, if those electives are not offered in later semesters, then alternate electives may be chosen from the same set of elective subjects offered under that category.
- 6.6 A student fulfilling the attendance requirement in the present semester shall not be eligible for readmission into the same class.

## 7.0 Academic Requirements

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

- 7.1 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course, if student secures not less than 35% (14 marks out of 40 marks) in the Continuous Internal Evaluation (CIE), not less than 35% (21 marks out of 60 marks) in the semester end examinations (SEE), and a minimum of 40% (40 marks out of 100 marks) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of letter grades, this implies securing 'C' grade or above in that subject/ course.
- 7.2 A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to Real-time Research Project (or) Field Based Research Project (or) Mini Project (or) Internship (or) Technical Seminar, if the student secures not less than 40% marks (i.e. 40 out of 100 allotted marks) in each of them. The student is deemed to have failed, if he (i) does not submit a report on Mini Project/Internship, or (ii) not make a presentation of the same before the evaluation committee as per schedule, or (iii) secures less than 40% marks in Real-time ResearchProject (or) Field Based Research Project (or) Mini Project (or) Internship (or) Technical Seminar evaluations.

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

S. No.	Promotion	Conditions to be fulfilled
1	First year first semester to	Regular course of study of first year first
	first year second semester	semester.
2	First year second semester to	(i) Regular course of study of first year
	Second year first semester	second semester.
		(ii) Must have secured at least 20 credits out of 40 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3.	Second year first semester to Second year second semester	Regular course of study of second year first semester.
4	Second year second semester to Third year first semester	(i) Regular course of study of second year second semester.
		(ii) Must have secured at least 48 credits out of 80 credits i.e., 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to Third year second semester	Regular course of study of third year first semester.
6	Third year second semester to Fourth year first semester	(i) Regular course of study of third year second semester.
		(ii) Must have secured at least 72 credits out
		of 120 credits i.e., 60% credits up to third year second semester from all the relevant
		regular and supplementary examinations,
		whether the student takes those examinations or not.
7	Fourth year first semester to	Regular course of study of fourth year first
	Fourth year second semester	semester.

## 7.3 **Promotion Rules**

- 7.4 A student (i) shall register for all courses/subjects covering 160 credits as specified and listed in the course structure, (ii) fulfills all the attendance and academic requirements for 160 credits, (iii) earn all 160 credits by securing SGPA  $\geq$  5.0 (in each semester), and CGPA  $\geq$  5 (at the end of 8 semesters), (iv) secured satisfactory grade in all the mandatory courses, to successfully complete the undergraduate programme. The performance of the student in these 160 credits shall be considered for the calculation of the final CGPA (at the end of undergraduate programme), and shall be indicated in the consolidated grade cum credit sheet.
- 7.5 If a student registers for 'extra subjects' (in the parent department or other departments/branches of Engg.) other than those listed subjects totaling to 160 credits as specified in the course structure of his department, the performances in those 'extra subjects' (although evaluated and graded using the same procedure as that of the required 160 credits) will not be considered while calculating the SGPA and CGPA. For such 'extra subjects' registered, percentage of marks and letter grade alone will be indicated in the grade card / marks memo as a performance measure, subject to completion of the attendance and academic requirements as stated in regulations Items 6 and 7.1 7.4 above.
- 7.6 A student eligible to appear in the semester end examination for any subject/ course, but absent from it or failed (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.
- 7.7 A student detained in a semester due to shortage of attendance may be re-admitted in the same semester in the next academic year for fulfillment of academic requirements. The academic regulations under which a student has been re-admitted shall be applicable. Further, no grade allotments or SGPA/ CGPA calculations will be done for the entire semester in which the student has been detained.
- 7.8 A student detained **due to lack of credits, shall be promoted to the next academic** year only after acquiring the required number of academic credits. The academic regulations under which the student has been readmitted shall be applicable to him.

## 8.0 Evaluation - Distribution and Weightage of Marks

- 8.1 The performance of a student in every subject/course (including practicals and Project Stage I & II) will be evaluated for 100 marks each, with 40 marks allotted for CIE (Continuous Internal Evaluation) and 60 marks for SEE (Semester End-Examination).
- 8.2 In CIE, for theory subjects, during a semester, there shall be two mid-term examinations. Each Mid-Term examination consists of two parts i) Part A for 10 marks, ii) Part B for 20 marks with a total duration of 2 hours as follows:
  - 1. Mid Term Examination for 30 marks:
    - a. Part A : Objective/quiz/short answer paper for 10 marks.
    - b. Part B : Descriptive paper for 20 marks.

The objective/quiz/short answer paper is set with multiple choice, fill-in the blanks, match the following type of questions and short answer questions for a total of 10 marks (10 questions). The descriptive paper shall contain6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks. The **average of the two Mid Term Examinations** shall be taken as the final marks for Mid Term Examination (for 30 marks).

The remaining 10 marks of Continuous Internal Evaluation are distributed as:

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

While the first mid-term examination shall be conducted on 50% of the syllabus, the second mid-term examination shall be conducted on the remaining 50% of the syllabus.

Five (5) marks are allocated for assignments (as specified by the subject teacher concerned). The first assignment should be submitted before the conduct of the first mid-term examination, and the second assignment should be submitted before the conduct of the second mid-term examination. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

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

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

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

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

There is NO Computer Based Test (CBT)/onetime improvement test of mid examinations for R22 regulations.

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

- **8.2.1** The semester end examinations (SEE), for theory subjects, will be conducted for 60 marks consisting of two parts viz. i) **Part- A** for 10 marks, ii) **Part B** for 50 marks.
  - Part-A is a compulsory question which consists of ten sub-questions from all units carrying equal marks.
  - Part-B consists of five questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from each unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two

questions from each unit and the student should answer either of the two questions.

- The duration of Semester End Examination is 3 hours.
- **8.3** For practical subjects there shall be a Continuous Internal Evaluation (CIE) during the semester for 40 marks and 60 marks for semester end examination. Out of the 40 marks for internal evaluation:
  - 1. A write-up on day-to-day experiment in the laboratory (in terms of aim, components/procedure, expected outcome) which shall be evaluated for 10 marks
  - 2. **10 marks for viva-voce (**or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.
  - 3. Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 10 marks.
  - 4. The remaining 10 marks are for Laboratory Project, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

The Semester End Examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the cluster / other colleges which will be decided by the examination branch of the University.

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

- 1. 10 marks for write-up
- 2. 15 for experiment/program
- 3. 15 for evaluation of results
- 4. 10 marks for presentation on another experiment/program in the same laboratory course and
- 5. 10 marks for viva-voce on concerned laboratory course.
- The Student, in each subject, shall have to earn 35% of marks (i.e. 14 marks out of 40 marks) in CIE, 35% of marks (i.e. 21 marks out of 60) in SEE and Over all 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

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

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

- **8.4** The evaluation of courses having ONLY internal marks in I Year I Semester and II Year II Semester is as follows:
  - 1. I Year I Semester course (*ex., Elements of CE/ME/EEE/ECE/CSE etc*): The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and

II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) is absent as per schedule, or (ii) secures less than 40% marks in this course.

- 2. II Year II Semester *Real-Time (or) Field-based Research Project* course: The internal evaluation is for 50 marks and it shall take place during I Mid-Term examination and II Mid-Term examination. The average marks of two Mid-Term examinations is the final for 50 marks. Student shall have to earn 40%, i.e 20 marks out of 50 marks from average of the two examinations. There shall be NO external evaluation. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the internal committee as per schedule, or (ii) secures less than 40% marks in this course.
- 8.5 There shall be Industry training (or) Internship (or) Mini-project (or) Skill Development Courses (or) Paper presentation in reputed journal in collaboration with an industry of their specialization. Studentsshall register for this immediately after II-Year II Semester Examinations and pursue itduring summer vacation/semester break & during III Year without effecting regular course work. Internship at reputed organization (or) Skill development courses (or) Paper presentation in reputed journal (or) Mini Project shall be submitted in a report form and presented before the committee in III-year II semester before end semester examination. It shall be evaluated for 100 external marks. The committee consists of an External Examiner, Head of the Department, Supervisor of the Mini Project (or) Internship etc, Internal Supervisor and a Senior Faculty Member of the Department. There shall be NO internal marks for Industry Training (or) Internship (or) Mini-Project (or) Skill Development Courses (or) Paper Presentation in reputed journal.
- 8.6 There shall be a Technical Seminar presentation in the VIII Semester. For the Technical Seminar, the student shall collect the information on a specialized topic related to his branch other than the Real-Time (or) Field-based Research Project/ Mini project/ Internship/ Major Projects Phase-I & II topic with due approval of the Head of the department and prepare a technical report and submit to the department. The presentation demonstrating understanding of the topic and technical report shall be evaluated by a Departmental committee consisting of the Head of the department, Technical Seminar supervisor and a senior faculty member from the department. The Technical Seminar will be evaluated for 100 marks.
- 8.7 The UG project shall be initiated at the end of the IV Year I Semester and the duration of the project work is one semester. The student must present Project Stage I during IV Year I Semester before II Mid examinations, in consultation with his Supervisor, the title, objective and plan of action of his Project work to the departmental committee for approval before commencement of IV Year II Semester. Only after obtaining the approval of the departmental committee, the student can start his project work.
- 8.8 UG project work shall be carried out in two stages: Project Stage I for approval of

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

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

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

8.10 For Project Stage – II, the external examiner shall evaluate the project work for 60 marks and the internal project committee shall evaluate it for 40 marks. Out of 40 internal marks, the departmental committee consisting of Head of the Department, Project Supervisor and a Senior Faculty Member shall evaluate the project work for 20 marks and Project Supervisor shall evaluate for 20 marks. The topics for Mini Project/ Internship/SDC etc. and the main Project shall be different from the topic already taken. The student is deemed to have failed, if he (i) does not submit a report on the Project, or (ii) does not make a presentation of the same before the External Examiner as per schedule, or (iii) secures less than 40% marks in the sum total of the CIE and SEE taken together.

For conducting viva-voce of project, The External Examiner shall be nominated by the Controller of Examinations from the panel of 3 names of external faculty members (Professors or Associate Professors outside the College) submitted by the HoD.

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

- **8.11** A student shall be given only one time chance to re-register for a maximum of two subjects in a semester:
  - If the internal marks secured by a student in the Continuous Internal Evaluation marks for 40 (Sum of average of two mid-term examinations consisting of Objective & descriptive parts, Average of two Assignments & Subject Vivavoce/PPT/ Poster presentation/ Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects.

A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the class work in next academic year.

In the event of the student taking this chance, his Continuous Internal Evaluation marks for 40 and Semester End Examination marks for 60 obtained in the previous attempt stand cancelled.

## 9.0 Grading Procedure

- **9.1** Grades will be awarded to indicate the performance of students in each Theory Subject, Laboratory/Practicals/ Mini Project/Internship/SDC and Project Stage. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 8 above, a corresponding letter grade shall be given.
- **9.2** As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed:

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	O (Outstanding)	10
80 and less than 90%	A <sup>+</sup> (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B <sup>+</sup> (Good)	7
50 and less than 60%	B (Average)	6
40 and less than 50%	C (Pass)	5
Below 40%	F (FAIL)	0
Absent	Ab	0

- **9.3** A student who has obtained an '**F**' grade in any subject shall be deemed to have '**failed**' and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.
- **9.4** To a student who has not appeared for an examination in any subject, '**Ab**' grade will be allocated in that subject, and he is deemed to have '**Failed**'. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.
- **9.5** A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.
- **9.6** A student earns Grade Point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding 'Credit Points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

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

- 9.7 A student passes the subject/ course only when  $GP \ge 5$  ('C' grade or above)
- 9.8 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of credit points (ΣCP) secured from all subjects/ courses registered in a semester, by the total number of credits registered during that semester. SGPA is rounded off to two decimal places. SGPA is thus computed as

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

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

**9.9** The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student in all semesters considered for registration. The CGPA is the ratio of the total credit points secured by a student in **all** registered courses (of 160) in **all** semesters, and the total number of credits registered in **all** the semesters. CGPA is rounded off to **two** decimal places. CGPA is thus computed from the I year II semester onwards at the end of each semester as per the formula

**CGPA** = {  $\sum_{j=1}^{M} C_j G_j$  } / {  $\sum_{j=1}^{M} C_j$  } ... for all S semesters registered

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

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

Course/Subject	Credits	Letter	Grade	Credit
Course/Subject	Creates	Grade	Points	Points
Course 1	4	А	8	$4 \times 8 = 32$
Course 2	4	0	10	$4 \ge 10 = 40$
Course 3	2	С	5	$2 \ge 5 = 10$
Course 4	3	В	6	$3 \times 6 = 18$
Course 5	1	A+	9	$1 \times 9 = 9$
Course 6	1	С	5	$1 \ge 5 = 5$
Course 7	1	0	10	$1 \ge 10 = 10$
Course 8	2	А	8	$2 \times 8 = 16$
Course 9	1	$\overline{\mathbf{B}}^+$	7	$1 \times 7 = 7$

## **Illustration of calculation of SGPA:**

B.Tech- R22 Academic Regulations

Course 10	1	$\mathrm{B}^+$	7	$1 \ge 7 = 7$
	20			154

SGPA = 154/20 = 7.7

-			Letter	Corresponding	Credit
Semester	Course/	Credits	Grade	Grade Point	Points
	Subject Title	Allotted	Secured	(GP)	(CP)
Ι	Course 1	4	А	8	32
Ι	Course 2	4	0	10	40
Ι	Course 3	2	В	6	12
Ι	Course 4	3	А	8	24
Ι	Course 5	1	A+	9	9
Ι	Course 6	1	С	5	5
Ι	Course 7	1	В	6	6
Ι	Course 8	2	А	8	16
Ι	Course 9	1	С	5	5
Ι	Course 10	1	0	10	10
II	Course 11	2	B+	7	14
II	Course 12	4	В	6	24
II	Course 13	4	А	8	32
II	Course 14	3	0	10	30
II	Course 15	1	А	8	8
II	Course 16	1.5	С	5	7.5
II	Course 17	1.5	0	10	15
II	Course 18	1.5	B+	7	10.5
II	Course 19	1.5	В	6	9
III	Course 20	4	А	8	32
III	Course 21	3	B+	7	21
III	Course 22	3	А	8	24
III	Course 23	3	0	10	30
III	Course 24	3	А	8	24
III	Course 25	2	С	5	10
III	Course 26	1	0	10	10
III	Course 27	1	B+	7	7
	Total Credits	60		Total Credit Points	467

## Illustration of Calculation of CGPA up to 3<sup>rd</sup> Semester:

## **CGPA = 467/60 = 7.78**

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

- **9.10** For merit ranking or comparison purposes or any other listing, **only** the '**rounded off**' values of the CGPAs will be used.
- **9.11** SGPA and CGPA of a semester will be mentioned in the semester Memorandum of Grades if all subjects of that semester are passed in first attempt. Otherwise the SGPA and CGPA shall be mentioned only on the Memorandum of Grades in which sitting he passed his last exam in that semester. However, mandatory courses will not be taken into consideration.

## 10.0 Passing Standards

- 10.1 A student shall be declared successful or 'passed' in a semester, if he secures a  $GP \ge 5$ ('C' grade or above) in every subject/course in that semester (i.e. when the student gets an SGPA  $\ge 5.0$  at the end of that particular semester); and he shall be declared successful or 'passed' in the entire undergraduate programme, only when gets a CGPA  $\ge 5.00$  ('C' grade or above) for the award of the degree as required.
- 10.2 After the completion of each semester, a grade card or grade sheet shall be issued to all the registered students of that semester, indicating the letter grades and credits earned. It will show the details of the courses registered (course code, title, no. of credits, grade earned, etc.) and credits earned. There is NO exemption of credits in any case.

## **11.0 Declaration of results**

- **11.1** Computation of SGPA and CGPA are done using the procedure listed in 9.6 to 9.9.
- **11.2** For final percentage of marks equivalent to the computed final CGPA, the following formula may be used.

## % of Marks = (final CGPA - 0.5) x 10

## 12.0 Award of Degree

- 12.1 A student who registers for all the specified subjects/ courses as listed in the course structure and secures the required number of 160 credits (with CGPA ≥ 5.0), within 8 academic years from the date of commencement of the first academic year, shall be declared to have 'qualified' for the award of B.Tech. degree in the branch of Engineering selected at the time of admission.
- **12.2** A student who qualifies for the award of the degree as listed in item 12.1 shall be placed in the following classes.
- 12.3 A student with final CGPA (at the end of the undergraduate programme) ≥ 8.00, and fulfilling the following conditions shall be placed in 'First Class with Distinction'. However, he
  - Should have passed all the subjects/courses in 'First Appearance' within the first 4 academic years (or 8 sequential semesters) from the date of commencement of first year first semester.
  - (ii) Should not have been detained or prevented from writing the semester end examinations in any semester due to shortage of attendance or any other reason.

A student not fulfilling any of the above conditions with final CGPA  $\ge 8$  shall be placed in 'First Class'.

- **12.4** Students with final CGPA (at the end of the undergraduate programme)  $\ge 7.0$  but < 8.00 shall be placed in 'First Class'.
- **12.5** Students with final CGPA (at the end of the undergraduate programme)  $\ge 6.00$  but < 7.00, shall be placed in 'Second Class'.
- 12.6 All other students who qualify for the award of the degree (as per item 12.1), with final CGPA (at the end of the undergraduate programme)  $\geq 5.00$  but < 6, shall be placed in 'pass class'.
- **12.7** A student with final CGPA (at the end of the undergraduate programme) < 5.00 will not be eligible for the award of the degree.
- **12.8** Students fulfilling the conditions listed under item 12.3 alone will be eligible for award of '**Gold Medal**'.

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

- A student is awarded 2-Year UG Diploma Certificate in the concerned engineering branch on completion of all the academic requirements and earned all the 80 credits (within 4 years from the date of admission) upto B.Tech. II Year II Semester, if the student want to exit the 4-Year B.Tech. program and *requests for the 2 -Year* B. Tech. (UG) Diploma Certificate.
- 2. The student once opted and awarded 2-Year UG Diploma Certificate, the student will be permitted to join in B. Tech. III Year I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree ONLY in the next academic year along with next batch students. *However, if any student wishes to continue the study after opting for exit, he/she should register for the subjects/courses in III Year I Semester before commencement of classwork for that semester.*
- 3. The students, who exit the 4-Year B. Tech. program after II Year of study and wish to re-join the B.Tech. program, must submit the 2 -Year B. Tech. (UG) Diploma Certificate awarded to him, subject to the eligibility for completion of Course/Degree.
- 4. A student may be permitted to take one year break after completion of II Year II Semester or B. Tech. III Year II Semester (with university permission through the principal of the college well in advance) and can re-enter the course in **next Academic Year in the same college** and complete the course on fulfilling all the academic credentials within a stipulated duration i.e. double the duration of the course (Ex. within 8 Years for 4-Year program).

## **13.0** Withholding of results

**13.1** If the student has not paid the fees to the College at any stage, or has dues pending due to any reason whatsoever, or if any case of indiscipline is pending, the result of the

student may be withheld, and the student will not be allowed to go into the next higher semester. The award or issue of the degree may also be withheld in such cases.

## 14.0 Transitory Regulations

- A. For students detained due to shortage of attendance:
  - 1. A Student who has been detained in I year of R18 Regulations due to lack of attendance, shall be permitted to join I year I Semester of R22 Regulations and he is required to complete the study of B.Tech. 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 to VIII semesters of R18 regulations for want of attendance, shall be permitted to join the corresponding semester of R22 Regulations and is required to complete the study of B.Tech. within the stipulated period of eight academic years from the date of first admission in I Year. The R22 Academic Regulations under which a student has been readmitted shall be applicable to that student from that semester. See rule (C) for further Transitory Regulations.
- B. For students detained due to shortage of credits:
  - 3. A student of R18 Regulations who has been detained due to lack of credits, shall be promoted to the next semester of R22 Regulations only after acquiring the required number of credits as per the corresponding regulations of his/her first admission. The student is required to complete the study of B.Tech. within the stipulated period of eight academic years from the year of first admission. The R22 Academic Regulations are applicable to a student from the year of readmission. See rule (C) for further Transitory Regulations.
- C. For readmitted students in R22 Regulations:
  - 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 R22 Regulations. There is NO exemption of credits in any case.
  - If a student is readmitted to R22 Regulations and has any subject with 80% of syllabus common with his/her previous regulations, that particular subject in R22 Regulations will be substituted by another subject to be suggested by the Board of Studies.
  - 7. The total credits required are 160 including both R18 & R22 regulations, and if the total credits are less than 160 including both R18 & R22 Regulations then an additional course(s) suggested by the Board of Studies may be given to fulfill the minimum requirements of 160 credits.

**Note:** If a student readmitted to R22 Regulations and has not studied any subjects/topics in his/her earlier regulations of study which is prerequisite for further subjects in R22 Regulations, the remedial classes shall be conducted to cover those

subjects/topics for the benefit of the students.

## 15.0 Student Transfers

- **15.1** There shall be no Branch transfers after the completion of Admission Process.
- **15.2** Transfer of candidates from other Institutions will be governed by the regulations of Telangana State Government issued from time to time.
- **15.3** The students seeking transfer to colleges affiliated to JNTUH from various other Universities/institutions have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the students have not studied at the earlier institution. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the students have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.
- **15.4** The transferred students from other Universities/Institutions to JNTUH affiliated colleges who are on rolls are to be provided one chance to write the CBT (for internal marks) in the equivalent subject(s) as per the clearance letter issued by the University.
- **15.5** The autonomous affiliated colleges have to provide one chance to write the internal examinations in the equivalent subject(s) to the students transferred from other universities/institutions to JNTUH autonomous affiliated colleges who are on rolls, as per the clearance (equivalence) letter issued by the University.

## 16.0 Scope

- i) Where the words "he", "him", "his", occur in the write-up of regulations, they include "she", "her", "hers".
- ii) Where the words "Subject" or "Subjects", occur in these regulations, they also imply "Course" or "Courses".
- iii) The Academic Regulations should be read as a whole, for the purpose of any interpretation.
- iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal/College Academic Council/Honourable Vice-Chancellor of JNTUH is final.
- v) The College may change 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 College Authorities.

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## ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME)

## (Applicable for the students admitted into II Year B.Tech (Lateral Entry Scheme) from the Academic Year 2023-24 and onwards)

## 1. <u>Eligibility for the award of B.Tech Degree (LES)</u>

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

- 2. The student shall register for 120 credits and secure 120 credits with CGPA  $\geq$  5 from II year to IV-year B.Tech. programme (LES) for the award of B.Tech. degree.
- **3.** The students, who fail to fulfil the requirement for the award of the degree in six academic years from the year of admission, shall forfeit their seat in B.Tech.
- 4. The attendance requirements of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

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

## 5. <u>Promotion rule</u>

- 6. All the other regulations as applicable to B. Tech. 4-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).
- 7. LES students are not eligible for 2-Year B. Tech. Diploma Certificate.

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## **MALPRACTICE RULES**

Disciplinary Action for Malpractices/Improper Conduct in Examinations

	Nature of Malpractices/ Improper	Punishment	
	conduct	1 นการกากเราน	
1.(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers, smart watches, electronic gadgets 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. Confiscation of Cell phones, pager, palm computers, smart watches, electronic gadgets etc. and the same would be handed over only after punishment finalized by Malpractice Committee.	
(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, pager, palm computers, smart watches, electronic gadgets 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. Confiscation of Cell phones, pager, palm computers, smart watches, electronic gadgets etc. and the same would be handed over only after punishment finalized by Malpractice Committee.	
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers, cell phones, smart watches, electronic gadgets 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 excluding Project work/ Mandatory Courses /Technical Seminar 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. Confiscation of Cell phones, pager, palm computers, smart watches, electronic gadgets etc. and the same would be handed over only after punishment finalized by Malpractice Committee.	
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 practicals 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 end semester 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 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 end semester 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	Cancellation of the performance in that subject
6.	requesting him to award pass marks Refuses to obey the orders of the Chief Superintendent/Assistant– Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the or organizes a walk out or instigates others <b>to</b> examination hall-walk out, or threatens the officer- in-charge or any person on duty in or outside the examination hall of any injury, to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer- in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College	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 are also 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.

	campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking 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 Semester End 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.	If the student belongs to the college, expulsion from the examination performance in that subject and all other subjects shall and cancellation of 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 state of inebriated/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 other remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during	Cancellation of the performance in that subject and all other subjects the

	special scrutiny.	candidate has appeared including practical examinations excluding Project work/ Mandatory Courses /Technical Seminar of that semester/year.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the College Academic Committee for further action to award suitable punishment.	

## Malpractices identified by squad or special invigilators

Punishments to the candidates as per the above guidelines.

## Malpractice identified at Spot center during valuation

- The following procedure is to be followed in the case of malpractice cases detected during valuation, scrutiny etc. at spot center. Malpractice is detected at the spot valuation. The case is to be referred to the malpractice committee. Malpractice committee will meet and discuss/question the candidate and based on the evidences, the committee will recommend suitable action on the candidate.
- 2) A notice is to be served to the candidate(s) involved through the Principal regarding the malpractice and seek explanations.
- 3) The involvement of staff who are in charge of conducting examinations, invigilators valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing in correct or misleading information) that infringe upon the course of natural justice to one and all concerned at the examinations shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.
- 4) Based on the explanation and recommendation of the committee action may be initiated.

## Malpractice committee:

(a) Chief Superintendent	Chairman
(b) Controller of Examinations	Member
(c) Dean Academics	Member
(d) Chief Examiner of the Course/ Subject Expert	Member
(e) Concerned Head of the Department	Member
(f) Observer	Member

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## CMR COLLEGE OF ENGINEERING & TECHNOLOGY

## (UGC AUTONOMOUS)

## B. Tech- Mechanical Engineering CBCS & OUTCOME BASED COURSE STRUCTURE (Effective for the students admitted into I year from the Academic Year 2022-23)

SEMESTER - I											
S.	Course	Course Title	Category	Hou	rs per W	eek	dits	Maxi Ma	mum irks		
No	Code	Course The	Category	L	Т	Р	Cre	CIE	SEE		
1	A400101	English for skill Enhancement	HSMC	2	0	0	2	40	60		
2	A400001	Matrices and Calculus	BSC	3	1	0	4	40	60		
3	A400008	Applied Physics	BSC	3	1	0	4	40	60		
4	A403201	Engineering Mechanics	ESC	3	0	0	3	40	60		
5	A403501	Elements of Mechanical Engineering	ESC	0	0	2	1	50	-		
6	A403503	Engineering Workshop	ESC	0	1	3	2.5	40	60		
7	A400503	English Language and Communication Skills Laboratory	HSMC	0	0	2	1	40	60		
8	A400501	Applied Physics Lab	BSC	0	0	3	1.5	40	60		
9	A400505	Introduction to Social Innovation	HSMC	0	0	2	1	40	60		
10	A400704	Universal Human Values	HSMC	2	0	0	0	-	-		
		Total:		13	3	12	20				
		Total hours per Week:			28						
		SEMES	STER - II	[				Mari			
S.	Course	Course Title	Category	Hour	's per W	eek	edits	Max	rks		
No	Code			L	Т	Р	Cr	CIE	SEE		
1	A400002	Ordinary Differential Equations and Vector Calculus	BSC	3	1	0	4	40	60		
2	A400009	Engineering Chemistry	BSC	3	1	0	4	40	60		
3	A403301	Engineering Materials	PCC	2	0	0	2	40	60		
4	A405202	C Programming and Data Structures	ESC	3	0	0	3	40	60		
5	A403202	Engineering Graphics	ESC	1	0	3	2.5	40	60		
6	A400502	Engineering Chemistry Laboratory	BSC	0	0	2	1	40	60		
7	A403505	Fuels & Lubricants Laboratory	PCC	0	0	2	1	40	60		
8	A405503	C Programming and Data Structures Laboratory	ESC	0	0	2	1	40	60		
9	A400506	Engineering Exploration & Practice	HSMC	0	0	3	1.5	40	60		
10	A400703	Constitution of India	МС	2	0	0	0	-	-		
		Total:		14	2	12	20				
		Total hours per Week			28						
		<b>Total Credits in I Ye</b>	ar: 40								

		SEMES	TER - III						
S.No.	Course	Course Title	Category	Hour	s per	Week	edits	Maxi Ma	imum irks
	Code			L	Т	Р	C	CIE	SEE
1	A403303	Metallurgy & Material Science	PCC	3	0	0	3	40	60
2	A403304	Thermodynamics	PCC	3	0	0	3	40	60
3	A403305	Mechanics of Solids	PCC	3	0	0	3	40	60
4	A401201	Fluid Mechanics & Hydraulic Machinery	ESC	3	0	0	3	40	60
5	A402204	Basic Electrical and Electronics Engineering	ESC	3	0	0	3	40	60
6	A401506	Fluid Mechanics & Hydraulic Machinery Lab	ESC	0	0	2	1	40	60
7	A402504	Basic Electrical and Electronics Engineering Lab	ESC	0	0	2	1	40	60
8	A400507	Social innovation in Practice	HSMC	0	0	2	1	40	60
9	A405506	Python Programming Laboratory	ESC	0	1	2	2	40	60
10	A400702	Gender Sensitization	MC	2	0	0	0	-	-
		Total:		17	1	8	20		
		Total hours per Week:			26	1			
		SEMES	TFR - IV						
		SEMEC	JIEK - IV					_	
S.No.	Course			Hour	s per	Week	lits	Maxi Ma	imum orks
S.No.	Course Code	Course Title	Category	Hour L	s per T	Week P	Credits	Maxi Ma CIE	mum irks SEE
<b>S.No.</b>	Course Code A400006	Course Title Probability, Statistics & Complex Variables	Category BSC	Hour L 3	s per T 1	Week P 0	4 Credits	Maxi Ma CIE 40	mum arks SEE 60
<b>S.No.</b> 1 2	Course Code A400006 A403302	Course Title Probability, Statistics & Complex Variables Manufacturing Processes	Category BSC PCC	Hour L 3 2	<b>s per T</b> 1 0	<b>Week P</b> 0 0	Credits	Maximum           Ma           CIE           40           40	mum rks SEE 60 60
<b>S.No.</b> 1 2 3	Course Code           A400006           A403302           A403306	Course Title  Probability, Statistics & Complex Variables Manufacturing Processes IC Engines & Gas Turbines	Category BSC PCC PCC	Hour           L           3           2           3	<b>s per T</b> 1 0 0	Week P 0 0 0 0	4 2 3	Maximum           Maximum           CIE           40           40           40	mum rks SEE 60 60 60
<b>S.No.</b> 1 2 3 4	Course Code           A400006           A403302           A403306           A403307	Course Title         Probability, Statistics & Complex         Variables         Manufacturing Processes         IC Engines & Gas Turbines         Kinematics of Machinery	Category BSC PCC PCC PCC	Hour           L           3           2           3           3           3           3           3	<pre>s per T 1 0 0 0 0</pre>	Week           P           0           0           0           0           0	4 2 3 3	Maximum           Maximum           CIE           40           40           40           40           40	mum           rks           SEE           60           60           60           60           60           60
S.No. 1 2 3 4 5	Course Code           A400006           A403302           A403306           A403307           A403309	Course Title         Probability, Statistics & Complex         Variables         Manufacturing Processes         IC Engines & Gas Turbines         Kinematics of Machinery         Instrumentation & Control Systems	Category BSC PCC PCC PCC PCC	Hour           L           3           2           3           3           3           2           3           2           3           2           3           2	<b>s per T</b> 1 0 0 0 0 0	Week           P           0           0           0           0           0           0           0           0	4 2 3 3 2	Maximum           Maximum           CIE           40           40           40           40           40           40           40           40	mum rks SEE 60 60 60 60 60
S.No. 1 2 3 4 5 6	Course Code           A400006           A403302           A403306           A403307           A403309           A403506	Course Title         Course Title         Probability, Statistics & Complex         Variables         Manufacturing Processes         IC Engines & Gas Turbines         Kinematics of Machinery         Instrumentation & Control Systems         Material Science & Mechanics of Solids Lab	Category BSC PCC PCC PCC PCC PCC	Hour           L           3           2           3           3           2           3           2           0	s per T 1 0 0 0 0 0	Week P 0 0 0 0 0 2	4 2 3 3 2 1	Maximum           Maximum           Maximum           CIE           40           40           40           40           40           40           40           40           40           40           40           40	mum rks SEE 60 60 60 60 60 60
S.No.	Course Code           A400006           A403302           A403306           A403307           A403309           A403506           A403507	Course Title         Probability, Statistics & Complex         Variables         Manufacturing Processes         IC Engines & Gas Turbines         Kinematics of Machinery         Instrumentation & Control Systems         Material Science & Mechanics of Solids Lab         Manufacturing Processes Lab	Category BSC PCC PCC PCC PCC PCC PCC PCC	Hour           L           3           2           3           2           3           2           0           0	s per T 1 0 0 0 0 0 0 0	Week           P           0           0           0           0           2           2	4 2 3 3 2 1 1	Maximu           Maximu           CIE           40           40           40           40           40           40           40           40           40           40           40           40           40           40           40           40	mum           see           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60
S.No. 1 2 3 4 5 6 7 8	Course Code           A400006           A403302           A403306           A403307           A403309           A403506           A403507           A403508	Course Title         Course Title         Probability, Statistics & Complex Variables         Manufacturing Processes         IC Engines & Gas Turbines         Kinematics of Machinery         Instrumentation & Control Systems         Material Science & Mechanics of Solids Lab         Manufacturing Processes Lab         Computer Aided Machine Drawing	Category BSC PCC PCC PCC PCC PCC PCC PCC	Hour           L           3           2           3           2           3           2           0           0           0           0           0	s per T 1 0 0 0 0 0 0 0 0 0 0	Week           P           0           0           0           0           2           2           2           2	4 2 3 3 2 1 1 1	Maximu           Maximu           CIE           40           40           40           40           40           40           40           40           40           40           40           40           40           40           40           40           40           40	mum           see           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60
S.No.	Course Code           A400006           A403302           A403306           A403307           A403309           A403506           A403507           A403508           A403509	Course Title         Course Title         Probability, Statistics & Complex Variables         Manufacturing Processes         IC Engines & Gas Turbines         Kinematics of Machinery         Instrumentation & Control Systems         Material Science & Mechanics of Solids Lab         Manufacturing Processes Lab         Computer Aided Machine Drawing         Instrumentation & Control Systems         Laboratory	Category BSC PCC PCC PCC PCC PCC PCC PCC PCC	Hour           L           3           2           3           2           3           2           0           0           0           0           0           0	s per         T         1         0	Week           P           0           0           0           0           2           2           2           2           2           2           2           2	4 2 3 3 2 1 1 1 1	Maxima           Maxima           CIE           40	mum           see           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60
S.No. 1 2 3 4 5 6 7 8 9 10	Course Code           A400006           A403302           A403306           A403307           A403309           A403506           A403507           A403508           A403509           A400701	Course Title         Probability, Statistics & Complex Variables         Manufacturing Processes         IC Engines & Gas Turbines         Kinematics of Machinery         Instrumentation & Control Systems         Material Science & Mechanics of Solids Lab         Manufacturing Processes Lab         Computer Aided Machine Drawing         Instrumentation & Control Systems Laboratory         Environmental Science	Category BSC PCC PCC PCC PCC PCC PCC PCC PCC PCC P	Hour           L           3           2           3           2           3           2           0           0           0           0           0           2	s per       T       1       0	Week           P           0           0           0           0           2           2           2           2           0	4 2 3 3 2 1 1 1 1 0	Maxima           Maxima           CIE           40	mum           see           60
S.No.  1  2  3  4  5  6  7  8  9  10  11	Course Code           A400006           A403302           A403306           A403307           A403309           A403506           A403507           A403508           A403509           A400701           A403801	Course Title         Probability, Statistics & Complex Variables         Manufacturing Processes         IC Engines & Gas Turbines         Kinematics of Machinery         Instrumentation & Control Systems         Material Science & Mechanics of Solids Lab         Manufacturing Processes Lab         Computer Aided Machine Drawing         Instrumentation & Control Systems Laboratory         Environmental Science         Real-Time Research Project/Field Based Project-I	Category BSC PCC PCC PCC PCC PCC PCC PCC PCC PCC P	Hour           L           3           2           3           2           3           2           0           0           0           0           0           0           0           0           0           0           0           0	s per T 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Week           P           0           0           0           0           0           2           2           2           2           2           2           2           4	4 2 3 3 2 1 1 1 1 2 2	Maxima           Maxima           CIE           40	mum           see           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60
S.No.  1  2  3  4  5  6  7  8  9  10  11	Course Code           A400006           A403302           A403306           A403307           A403309           A403506           A403507           A403508           A403509           A400701           A403801	Course Title         Probability, Statistics & Complex Variables         Manufacturing Processes         IC Engines & Gas Turbines         Kinematics of Machinery         Instrumentation & Control Systems         Material Science & Mechanics of Solids Lab         Manufacturing Processes Lab         Computer Aided Machine Drawing         Instrumentation & Control Systems Laboratory         Environmental Science         Real-Time Research Project/Field Based Project-I	Category BSC PCC PCC PCC PCC PCC PCC PCC PCC PCC P	Hour           L           3           2           3           2           3           2           0           0           0           0           0           0           15	s per         T         1         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         0         1	Week           P           0           0           0           0           0           2           2           2           2           2           2           2           2           2           12	4 2 3 3 2 1 1 1 1 2 20	Maximu           Maximu           CIE           40	mum           see           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60           60

#### **Total Credits in II Year: 40**

#### (A400101) ENGLISH FOR SKILL ENHANCEMENT (Common to all branches)

L T P C 2 0 0 2

## **B.Tech I Year I Semester**

## UNIT - I

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

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

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

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

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

## UNIT – II

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

**Vocabulary**: Words Often Misspelt - Homophones, Homonyms and Homographs Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement. **Reading:** Sub-Skills of Reading – Skimming and Scanning

#### UNIT – III

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

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

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

Reading: Sub-Skills of Reading - Intensive Reading and Extensive Reading - Exercises forPractice.

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

#### UNIT - IV

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

Vocabulary: Standard Abbreviations in English Grammar: Redundancies and Clichés in Oraland Written Communication.

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

Essay Writing-Writing Introductionand Conclusion - Précis Writing

#### UNIT - V

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

Reading: Writing: Reading Comprehension-Exercises forPractice Technical Reports- Introduction.

## NOTE:

Listening and Speaking Skills which are given under in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.

- NOTE 1: As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech FirstYear is Open-ended, besides following the prescribed textbook, it is required to prepareteaching/learning materials by the teachers collectively in the form of handouts based on theneeds of the students in their respective colleges for effective teaching/learning in the class.
- NOTE 2: Based on the recommendations of NEP2020, teachers are requested to be flexibleto adopt Blended Learning in dealing with the course contents .They are advised to teach 40percent of each topic from the syllabus in blended mode.

## **TEXT BOOK:**

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

## **REFERENCE BOOKS:**

1. Effective Academic Writing, (2<sup>nd</sup> Edition) by Liss and Davis (OUP) 2014

- 2. Richards, Jack C. Interchange Series. Introduction, (4th Edition), Cambridge University Press 2022
- 3. Remedial English Grammar by Wood F.T, Macmillan. 2007.

4. Learn English: A Fun Book of Functional Language, Grammar and Vocabulary, (2<sup>nd</sup> Edition) Chaudhuri, SantanuSinha, Sage Publications India Pvt. Ltd. 2018

5. Technical Communication, (1<sup>st</sup> Edition), Wiley India Pvt. Ltd. 2019

6. English for Technical Communication for Engineering, Vishwamohan, Aysha 2013

## **Course Outcomes:**

On completion of the course students will be able to

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

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

## (A400001) MATRICES AND CALCULUS

(Common toAll)

## **B.Tech I Year I Semester**

## L T P C 3 1 0 4

## UNIT-I

**Matrices:** Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous equations and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

## UNIT-II

## Eigen values and Eigen vectors:

Linear Transformation and Orthogonal transformation:Eigen values, Eigen vectors and their properties, Diagonalization of a square matrix, Cayley-Hamilton theorem (without proof) - Inverse and power of a matrix by Cayley-Hamilton theorem, Quadratic forms and nature of the quadratic forms, Reduction of quadratic form to canonical form by orthogonal transformations.

## UNIT-III

**Calculus:** 

**Mean value theorems:** Rolle's theorem, Lagrange's mean value theorem with their geometrical interpretation and applications, Cauchy's mean value theorem, Taylor's series, Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (only in Cartesian coordinates), **Improper Integral:** Beta, Gamma functions and their applications.

UNIT-IV

## Multivariable calculus (Partial Differentiation and applications):

Partial differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

## UNIT-V

## Multivariable Calculus (Integration):

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (onlyCartesian form), Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesianto Spherical and Cylindricalpolarcoordinates) for triple integrals.

## **TEXT BOOKS:**

- 1. Higher Engineering Mathematics, (36<sup>th</sup> Edition), B.S. Grewal, Khanna Publishers, 2010.
- 2. Advanced Engineering Mathematics, (5<sup>th</sup> Edition), R.K. Jain and S.R.K Iyengar, Narosa Publications, 2016.

## **REFERENCE BOOKS:**

- 1. Advanced Engineering Mathematics, (9th Edition), Erwinkreyszig, JohnWiley& Sons, 2006.
- 2. Calculus and Analytic geometry, (9<sup>th</sup>Edition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.
- 3. A text book of Engineering Mathematics, (10<sup>th</sup> Edition), N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2019.
- 4. Higher Engineering Mathematics, (11<sup>th</sup> Reprint), Ramana B.V., Tata McGraw Hill New Delhi, 2010.

## **COURSE OUTCOMES:.**

On completion of the course students will be able to

- 1. Solve linear system of equations represented by matrices
- 2. Obtain Eigen values, Eigen vectors and perform diagonalization of a square matrix.
- 3. Verify mean value theorems & evaluation of improper integrals by using Beta and Gamma functions.
- 4. Develop the skill of determining optimal values of multivariable functions using classical methods.
- 5. Evaluate the multiple integrals and apply the concept to find areas, volumes

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

#### (A400008) APPLIED PHYSICS (Common to all branches)

#### **B.Tech I Year I Semester**

L	Т	Р	С
3	1	0	4

#### UNIT – I

#### **QUANTUM MECHANICS:**

Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect – de Broglie hypothesis- Davisson and Germer experiment – Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

#### **ELECTRIC PROPERTIES OF SOLIDS:**

Free electron theory (Drude& Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron-origin of energy bands- classification of solids.

#### UNIT – II

#### **SEMICONDUCTORS AND DEVICES:**

Intrinsic and extrinsic semiconductors, Variation of Fermi level with temperature – Hall Effect - Construction, principle of operation and characteristics of P-N Junction diode, Zener diode

#### **PHOTONIC DEVICES**

Direct and indirect band gap semiconductors –LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

## UNIT – III

#### LASERS

Laser beam characteristics-three quantum processes-Einstein coefficients and their relations- lasing action - pumping methods- ruby laser, He-Ne laser,  $CO_2$  laser - semiconductor laser-applications of laser.

## **FIBER OPTICS:**

Introduction optical fiber - advantages of optical fibers - total internal reflection - construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers - losses in optical fiber - optical fiber for communication system - applications

## UNIT - IV

#### DIELECTRIC MATERIALS

Dielectric Materials: Basic definitions- types of polarizations (qualitative) –Local field – ClasiusMossoti Equation ferroelectric, piezoelectric, and pyroelectric materials – applications

#### **MAGNETIC MATERIALS:**

Introduction to magnetic materials - Hysteresis-soft and hard magnetic materials - magnetostriction, magnetoresistance - applications - bubble memory devices, magnetic field sensors and multiferroics

#### UNIT - V

#### **ENERGY MATERIALS:**

Conductivity of liquid and solid electrolytes - superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells

#### NANOTECHNOLOGY

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

#### **TEXT BOOKS**

1. Engineering Physics (3rd edition), PK Palanisamy, SciTech Publications, 2015

2. Essentials of Nano science & Nano technology (1<sup>st</sup> Edition), Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 2021

#### REFERENCES

1. Fundamentals of Physics.(6th edition), Halliday, R.Resnick and J.Walker, John Wiley and Sons, 2001.

2. Quantum Physics,(2nd edition), H.C. Verma, TBS Publication, 2012

3. Introduction to Solid State Physics, (7th edition), Charles Kittel, Wiley Eastern, 2019.

4. Physics of Semiconductor devices (4th edition), Simon.MSze and Kwok K. Ng, Wiley Student Edition, 2006.

## **COURSE OUTCOMES:**

On completion of the course students will be able to

1. Understand the concepts of Quantum mechanics and visualize the differences between the solids by their classification.

2. Identify and analyze the importance of semiconductors and semiconductor devices in Science and Engineering Applications.

3. Appreciate the features and applications of Lasers and Optical fibers.

4. Applying the fundamental properties of dielectric and magnetic materials in different engineering fields.

5. Evaluate various aspects of Energy Materials and Nano-materials and their applications in diverse fields.

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

#### (A403201) ENGINEERING MECHANICS (Common to Mech & Civil)

## L T P C 3 0 0 3

#### **B.Tech I Year I Semester**

#### UNIT - I:

**Introduction to Engineering Mechanics**: Force Systems: Basic concepts, Particle equilibrium in 2-D & 3-D, Rigid Body equilibrium, System of Forces: Coplanar Concurrent Forces, Components in Space – Resultant - Moment of Forces and its Application; Couples and Resultant of Force System.

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 Friction; Motion of Bodies **Applications of friction:** Wedge friction, Screw jack & differential screw jack;

#### UNIT - III:

Centroid and Centre of Gravity: Centroid of Lines, Areas and Volumes from first principle, Centroid of Composite sections

Centre of Gravity: Centre of gravity of simple bodies, Composite bodies - Theorem of Pappus

#### UNIT - IV:

Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Parallel Axis Theorem, Perpendicular Axis Theorem

Mass Moment of Inertia: Moment of Inertia of Masses - Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies.

### UNIT - V:

**Work – Energy Method:** Equations for Translation, Work-Energy Applications to Particle Motion, Connected Systems. Fixed Axis Rotation and Plane Motion, Impulse momentum method

#### **TEXT BOOKS:**

- Reddy Vijay Kumar K. and J. Suresh Kumar (2011), Engineering Mechanics Statics & Dynamics, Singer's, 3<sup>rd</sup> Edition.
- 2. Bhavikatti S.S (2019), Engineering Mechanics, New age international publishers, 7th Edition,

#### **REFERENCE BOOKS:**

- 1. Dumir P.C, Sengupta, Srinivas (2020), Engineering Mechanics- Universities Press, 1<sup>st</sup> edition.
- 2. Hibbeler R.C, Engineering Mechanics, Pearson, 14th Edition.
- 3. Arshad Noor, Zahid & Goel (2018), Engineering Mechanics, Cambridge University Press, 1<sup>st</sup> edition
- 4. Khurmi R.S, Khurmi N. (2018), Engineering Mechanics, S. Chand publishing, 22<sup>nd</sup> edition.
- 5. Shames and Rao (2016), Engineering Mechanics, Pearson Education, 4<sup>th</sup> edition

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

- 1. Determine resultant of forces acting on a body and analyse equilibrium of a body subjected to a system of forces.
- 2. Solve problem of bodies subjected to friction.
- 3. Find the location of Centroid and Centre of gravity of a given section.
- 4. Calculate moment of inertia and mass moment of inertia of a given section.
- 5. Solve problems using work energy equations for translation, fixed axis rotation and plane motion.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12
CO1	3	-	3	-	-	2	1	-	-	-	-	1
CO2	3	-	3	-	-	2	1	-	-	-	-	1
CO3	3	-	3	-	-	2	1	-	-	-	-	1
CO4	3	-	3	-	-	2	1	-	-	-	-	1
CO5	3	-	3	-	-	2	1	-	-	-	-	1

## (A403501) ELEMENTS OF MECHANICAL ENGINEERING

L	Т	Р	С
0	0	2	1

#### **B.Tech I Year I Semester**

### List of Experiments to be performed:

- 1. Measurement of length, height, diameter by vernier calipers.
- 2. To measure diameter of a given wire and sphere, thickness of a given sheet and volume of an irregular lamina using micrometer screw gauge.
- 3. Use of straight edge and sprit level in finding the flatness of surface plate.
- 4. Determination of time period and natural frequency of simple pendulum.
- 5. Determination of time period and natural frequency of compound pendulum.
- 6. To measure the coefficients of static and kinetic friction between a block and a plane using various combination of materials.
- 7. To determine the radius of curvature of a given spherical surface.
- 8. The experimental determination of the Moment of Inertia of regular and irregular solids.
- 9. Metal joining process-soldering of metal alloys to any PCB board
- 10. A simple composite geometry preparation by hand layup method.
- 11. Grouping of Dry cells for a specified voltage and current and its measurement using ammeters and voltmeters etc.
- 12. Demonstration of lathe, milling, drilling, grinding machine operations.
- 13. Study of transmission system -gear box
- 14. Assembly /disassembly of Engines
- 15. Study of Boilers

Note: Perform any 10 out of the 15 Exercises.

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

- 1. Understand the operation, usage and applications of different measuring instruments and tools.
- 2. Examine the different characteristics of instruments like accuracy, precision etc
- 3. Prepare simple composite components and joining different materials using soldering process.
- 4. Identify tools & learn practically the process of turning, milling, grinding on mild steel pieces.
- 5. Understand the basic components of IC engine, Gear box and boiler

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

## (A403503) ENGINEERING WORKSHOP

(Common to Mech & Civil)

L	Т	Р	С
0	1	3	2.5

#### **B.Tech I Year I Semester**

Pre-requisites: Practical skill

## **1. TRADES FOR EXERCISES:**

#### At least two exercises from each trade:

- I. Carpentry
- II. Fitting
- Tin-Smithy III.
- IV. Foundry
- V. Welding Practice
- VI. House-wiring
- VII. Black Smithy

## 2. TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Lathe, Power tools

## **TEXT BOOKS:**

- Workshop Practice, B. L. Juneja, Cengage, 2016 1.
- 2. Workshop Manual, K. Venugopal, Anuradha Pub, 2012

#### **REFERENCE BOOKS:**

- 1. Work shop Manual, 2<sup>nd</sup> Edition, P. Kannaiah & K.L. Narayana, Scitech Publishers, 2008
- Workshop Manual, 6<sup>th</sup> Edition, Venkat Reddy, BS Publications, 2008 2.

## **Course Outcomes**:

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

- 1. Study and practice on trade tools and their operations
- 2. Practice and prepare components using workshop trades including carpentry, fitting, Tin smithy.
- 3. Practice and prepare components using workshop trades including Foundry, welding.
- 4. Practice and prepare components using workshop trades including House wiring, black smithy and Plumbing.
- 5. Acquire knowledge by exposure to modern Tools.

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

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#### (A400503) ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY (Common to all branches)

## **B.Tech I Year I Semester**

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

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

- Computer Assisted Language Learning (CALL) Lab
- Interactive Communication Skills (ICS) Lab  $\geq$

## Listening SkillsObjectives

- To enable students develop their listening skills so that they may appreciate the role in the LSRW skills approach to language and improve their pronunciation
- $\triangleright$ To equip students with necessary training in listening, so that they can comprehend the speech of people of different backgrounds and regions. Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.
  - Listening for general content
  - Listening to fill up information
  - Intensive listening
  - Listening for specific information

## Speaking SkillsObjectives

- To involve students in speaking activities in various contexts
- To enable students express themselves fluently and appropriately in social and professional
- > Oral practice
- Describing objects/situations/people
- Role play Individual/Group activities
- Just A Minute (JAM) Sessions ≻ The following course content is prescribed for the English Language and Communication Skills Lab

## Exercise - I

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

ICS Lab: Understand: Spoken vs. Written language- Formal and Informal English. Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues - Greetings - Taking Leave - Introducing Oneself and Others.

## Exercise – II

CALL Lab: Understand: Structure of Syllables - Word Stress- Weak Forms and Strong Forms - Stress pattern in sentences - Intonation. Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms-Stress pattern in sentences - Intonation - Testing Exercises.

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

#### Exercise – III

CALL Lab: Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI). Practice: Common Indian Variants in Pronunciation - Differences between British and American Pronunciation -Testing Exercises

ICS Lab: Understand: Descriptions- Narrations- Giving Directions and Guidelines - Blog Writing Practice: Giving Instructions - Seeking Clarifications - Asking for and Giving Directions - Thanking and Responding -Agreeing and Disagreeing - Seeking and Giving Advice - Making Suggestions.

#### Exercise - IV

CALL Lab: Understand: Listening for General Details. Practice: Listening Comprehension Tests - Testing Exercises

ICS Lab: Understand: Public Speaking - Exposure to Structured Talks - Non-verbal

CommunicationPresentation Skills. Practice: Making a Short Speech - Extempore- Making a Presentation. Exercise - V

CALL Lab: Understand: Listening for Specific Details. Practice: Listening Comprehension Tests - Testing Exercises

ICS Lab: Understand: Group Discussion Practice: Group Discussion

## Minimum Requirement of infrastructural facilities for ELCS Lab:

- 1. **Computer Assisted Language Learning (CALL) Lab:** The Computer Assisted Language Learning Lab has to accommodate 30 students with 30 systems, with one Master Console, LAN facility and English language learning software for self- study by students. System Requirement (Hardware component): Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications: i) Computers with Suitable Configuration ii) High Fidelity Headphones
- 2. Interactive Communication Skills (ICS) Lab: The Interactive Communication Skills Lab: A Spacious room with movable chairs and audiovisual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc. Source of Material (Master Copy): Exercises in Spoken English. Part 1, 2, 3. CIEFL and Oxford University Press Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus

## **REFERENCE BOOKS:**

- 1. English Language Communication Skills Lab Manual cum Workbook, (1<sup>st</sup> edition), by Rajesh Kumar Cengage Learning India Pvt. Ltd, 2022
- 2. Communicative English A workbook, (Revised Edition) by Shobha, KN & Rayen, J. Lourdes, Cambridge University Press, 2019.
- 3. Communication Skills: A Workbook. Kumar, (2<sup>nd</sup> edition) by Sanjay &Lata, Pushp, Oxford University Press, 2019.
- 4. ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities,(Board of Editors), Orient Black Swan Pvt. Ltd, 2016
- 5. English Language Skills: A Practical Approach, Mishra, Veerendra et al., Cambridge University Press, 2020.

## **Course Outcomes**:

On completion of the course students will be able to

- 1. Understand the nuances of English language through audio- visual experience and group activities.
- 2. Neutralise their accent for intelligibility.
- 3. Speak with clarity and confidence which in turn enhances their employability skills
- 4. Students will learn public speaking skills and overcome stage fear.
- 5. Express clarity of thoughts, capability to hold the discussion with everyone and develop analytical thinking.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-		2	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	-	-	-	-	-	-	-	3	2	-
CO4	-	-	-	-	-	-	-	-	-	3	-	2
CO5	-	-	-	-	-	-	-	-	-	2	-	2
### (A400501) APPLIED PHYSICS LAB

#### **B.Tech I Year I Semester**

#### L T P C 0 0 3 1.5

# (Any 8 experiments are to be performed)

- 1. Determination of work function and Planck's constant using photoelectric effect.
- 2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
- 3. Characteristics of series and parallel LCR circuits.
- 4. V-I characteristics of a p-n junction diode and Zener diode
- 5. a) V-I and L-I characteristics of light emitting diode (LED)b)V-I Characteristics of solar cell
- 6. Determination of Energy gap of a semiconductor.
- 7. Determination of the resistivity of semiconductor by two probe method.
- 8. Study of B-H curve of a magnetic material.
- 9. Determination of dielectric constant of a given material
- 10. a) Determination of the beam divergence of the given LASER beam)Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
- 11. Understanding the method of least squares torsional pendulum as an example.
- 12. Diffraction grating: Determination of wavelength of a source (LASER).

# LABORATORY MANUAL:

- 1. Applied Lab (2<sup>nd</sup> Edition) Dr M Chandra Shekhar Reddy, Dr NeelimaPatnaik, Jaya Prakash Reddy Kasu, Skytech Publications, 2022.
- "A Text book of Practical Physics" (2<sup>nd</sup> Edition) S. Balasubramanian, M.N. Srinivasan S Chand Publishers, 2017.

#### **COURSE OUTCOMES**

On completion of the course students will be able to

- 1. Appreciate quantum physics in optoelectronics.
- 2. Determine the Planck's constant using Photo electric effect
- 3. Determine energy gap of a semiconductor diode and magnetic fields.
- 4. Identify the material whether it is n-type or p-type by Hall experiment.
- 5. Evaluate the basic properties of lasers and optical fibers.

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

#### (A400505) INTRODUCTION TO SOCIAL INNOVATION (Common to all branches)

L	Т	Р	С
0	0	2	1

**B.Tech I Year I Semester** WEEK-1: Types and features of community- Rural, Suburban, Urban and Regional WEEK-2: Service based learning; Aims of Community based projects, Sustainable Development Goals **WEEK-3:** Community visit, Report Writing, Resource Diagram, Chapati Diagram, Transect Walk **WEEK-4:** The non-profit sector, public sector, the private sector, the informal sector **WEEK-5:** Poster presentation on four sectors WEEK-6: Process of Design Thinking **WEEK-7:** Social organizations and enterprises, social movements **WEEK-8:** Social softwares and open-source methods **WEEK-9:** Introduction to Ethics, moral values, significance of professional ethics code of conduct for engineers **WEEK-10:** Identify ethical dilemmas in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas **WEEK-11:** Case studies on Engineering Ethics **WEEK-12:** Documentation, Steps for Patent filing and Startups, Poster presentation **TEXT BOOKS:** Social Entrepreneurship for the 21st Century: Innovation Across the Non Profit, Private and Public 1. Sectors; Georgia Levenson Keohane; Tata McGraw Hill Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, YeheskelHasenfeld; Palgrave 2. Macmillan 3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand - Improve -Apply", Springer, 2011. Solving Problems with Design Thinking - Ten Stories of What Works (Columbia Business School 4. Publishing) Hardcover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author)

- 5. Engineering Ethics: An Industrial Perspective; Gail Baura; Elsevier
- 6. Intellectual Property and Financing Strategies for Technology Startups; Gerald B. Halt, Jr., John C. Donch, Jr., Amber R. Stiles, Robert Fesnak; Springer
- 7. Fundamentals of Intellectual Property (English) 1st Edition (Paperback, Dr. Kalyan C. Kankanala) Publisher: Asia Law House ISBN: 9789381849514, 938184951X Edition: 1st Edition, 2012.
- 8. Indian Patent Law (English, Paperback, Kalyan C. Kankanala) Publisher: Oxford University Press- New Delhi, ISBN: 9780198089605, 0198089600 Edition: 2012.

# **COURSE OUTCOMES:**

On Completion of the course, the students will be able to

- 1. Identify community issues through community Interaction
- 2. Illustrate the factors affecting social innovation in various sectors
- 3. Apply design thinking concept to analyze the community problems
- 4. Adopt the ethical values in implementing the Social innovation
- 5. Describe the process of property rights and patent filing.

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

#### (A400704) UNIVERSAL HUMAN VALUES (Common to all branches)

L	Т	Р	С
2	0	0	0

# **B.Tech I Year I Semester**

# UNIT - I

Basic Guidelines, Content and Process for Value Education

- > Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration-what is it? Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- > Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
- ▶ Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

> Method to fulfil the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

#### UNIT - II

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- ▶ Understanding the needs of Self ('I') and 'Body' happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

### UNIT – III

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals • Visualizing a universal harmonious order in society- Undivided Society, Universal Orderfrom family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, and goal of education etc., Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

#### UNIT - IV

Understanding Harmony in the Nature and Existence – Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and selfregulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
- Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

#### UNIT – V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- > Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

- Competence in professional ethics:
  - a. Ability to utilize the professional competence for augmenting universal human order
  - b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems,
  - c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

# **TEXTBOOKS:**

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019.

# **REFERENCE BOOKS:**

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amar kantak, 1999.

- 2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
- 3. The Story of Stuff (Book).
- 4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"

# **COURSE OUTCOMES**:

On completion of the course students will be able to

- 1) Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
- 2) They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind. •
- 3) They would have better critical ability about various issues in life.
- 4) They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- 5) It is hoped that they would be able to apply what they have learnt to their own self in different day-today settings in real life, at least a beginning would be made in this direction.

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

# (A400002) ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to All)

L	Т	Р	С
3	1	0	4

#### **B.Tech. I Year II Semester**

#### UNIT-I

#### First Order ODE:

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's differential equations, Orthogonal Trajectories (only in Cartesian Coordinates), Applications: Newton's law ofcooling, Lawofnatural growth and decay

# UNIT-II

#### OrdinaryDifferential EquationsofHigherOrder:

Second and higher order linear differential equations with constant coefficients: Non-Homogeneous terms of the type  $e^{ax}$ , sin ax, cosax, polynomials in x, (x) and xV(x), methodof variation of parameters.

#### UNIT-III

#### Laplacetransforms:

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

#### UNIT-IV

# VectorDifferentiation:

Vectorpointfunctionsandscalarpointfunctions, Gradient, Tangent plane and normal line, Directionalderivatives, Divergence and Curl, Solenoidal and Irrotational vectors, Scalar potential functions, Vector Identities

#### UNIT-V

#### VectorIntegration:

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

#### **TEXT BOOKS:**

- 1. Higher Engineering Mathematics, (36<sup>th</sup> Edition), B.S. Grewal, Khanna Publishers, 2010.
- 2. AdvancedEngineeringMathematics, (5<sup>th</sup> Edition), R.K.Jainand, S.R.K.Iyengar, Narosa Publications, 2016

#### **REFERENCE BOOKS:**

- 1. Advanced Engineering Mathematics, (9<sup>th</sup> Edition), Erwin kreyszig, John Wiley & Sons, 2006
- 2. Calculus and Analytic geometry, (9<sup>th</sup> Edition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002
- 3. A text book of Engineering Mathematics, (10<sup>th</sup> Edition), N.P. Bali and Manish Goyal, Laxmi Publications, Reprint, 2019
- 4. Higher Engineering Mathematics, (9<sup>th</sup> Edition), H.K.Dassand, Er.RajnishVerma, S. Chand and companyLimited, NewDelhi, 2011

#### **COURSE OUTCOMES:**

On completion of the course students will be able to

- 1. Determine first order differential equations and obtain solutions.
- 2. Solve the Higher order differential equations and apply the differential equation concepts to real world problems.
- 3. Use the Laplace transforms techniques for solving ODE's.
- 4. Evaluate Gradient Divergence Curl, Directional derivatives.
- 5. Evaluate the line, surface and volume integrals and converting them from one toanother.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										2
CO2	3	3										2
CO3	3	3										2
<b>CO4</b>	3	3										2
CO5	3	3										2

# (A400009) ENGINEERING CHEMISTRY

(Common to all Branches)

L	Т	Р	С
3	1	0	4

#### **B.Tech. I Year II Semester**

#### UNIT-I: Electrochemistry, Batteries and Corrosion

**Electrochemistry:** Electrode potential, standard electrode potential and E.M.F of the cell. Electrochemical cell, Nernst equation- derivation and applications, Types of electrodes- Quinhydrone electrode, Calomel electrode and Glass electrode.Electro chemical series and its applications.**Batteries**- primary (Lithium cell), secondary (Lead acid storage battery and Lithium-ion battery) and Fuel cells ( $H_2$ - $O_2$  and methanol-oxygen), Solar cells -Introduction and applications of Solar cells.

**Corrosion:** Introduction, Definition, Causes and effects of corrosion, Theories of chemical and electrochemical corrosion, Pilling-Bedworth rule, Types of corrosion- Galvanic, Waterline and Pitting corrosion, Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection, Sacrificial anode and Impressed current cathodic methods, Surface coatings- Metallic coatings, hot dipping, galvanizing and tinning, Electroplating-Copper plating and electrolessplating - Nickel plating.

#### **UNIT-II: Material Chemistry - High Polymers**

Types of polymerizations (addition, condensation and copolymerization)

**Plastics:** Thermoplastic and Thermosetting resins, Compounding and fabrication of plastics (compression and injection moulding). Preparation, properties, engineering applications of PVC, Teflon and Bakelite

Fibers: Characteristics of fibers - preparation, properties and uses of Nylon-6,6 and Dacron, Fiber Reinforced Plastics (FRP) - applications.

**Rubbers:** Natural rubber and its vulcanization. Elastomers: Buna-s, Butyl rubber and Thiokol rubber. **Conducting polymers:** Characteristics and Classification with examples-mechanism of conduction in transpolyacetylene and applications of conducting polymers.

Biodegradable polymers: Preparation and applications of Polyvinyl acetate, Polylactic acid and poly vinyl alcohol.

#### **UNIT-III: Energy Sources**

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

#### **UNIT-IV: Water Technology**

Sources of water, Impurities in water, Hardness of water, Temporary and permanent hardness, Units of hardness, Estimation of temporary and permanent hardness of water, EDTA method, Numerical problems, Potable water Treatment-Specifications, Steps involved in Treatment-Sedimentation, Coagulation, Filtration, Sterilization, Desalination of Brackish Water, Reverse Osmosis and Electro dialysis.

Industrial water treatment, Boiler Troubles-Scales and sludges, Caustic embrittlement, Boiler corrosion Priming and foaming, Hot lime and cold lime soda Process-Numerical problems, Zeolite process and Ion exchange process. Internal conditioning methods like Phosphate, Carbonate, Calgon and Colloidal conditioning.

# **UNIT-V: Engineering Materials**

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

Smart materials: Smart materials and their engineering applications

Advanced Glass Technology: Structure and nature of glasses, transformation range behaviour, dependence of physico-chemical characteristic of glasses on their constituents. Strength of glass and glass articles

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

#### **TEXT BOOKS:**

- 1. Engineering chemistry (1<sup>st</sup> edition), B. Rama Devi & Ch. VenkataRamana Reddy; Cengage Learning, 2012.
- 2. Engineering Chemistry (1st edition), P. C. Jain and M. Jain, DhanapatRai& Sons.
- 3. Engineering chemistry (1<sup>st</sup> edition), Dr. Bharathikumari, Dr. Jyotsna.
- 4. Engineering chemistry (1<sup>st</sup> edition), Thirumala chary, E. Laxminyarana, SCITECH Publications (India) Pvt. Ltd.

### **REFERENCE BOOKS:**

- Engineering Chemistry (2<sup>nd</sup> edition), ShikhaAgarwal; Cambridge University Press, 2015.
  Engineering Chemistry (2<sup>nd</sup> edition), Wiley India Pvt. Ltd., Vairam and others, 2014.
- 3. Engineering Chemistry (1<sup>st</sup> edition), PrasanthRath, Cengage Learning, 2015.
- 4. Applied Chemistry (1<sup>st</sup> edition), H.D. Gesser, Springer Publishers.
- 5. Engineering Chemistry (3<sup>rd</sup> edition), B. Siva Shankar, Tata McGraw Hill Publishing Limited, 2015.
- 6. Text of Engineering Chemistry (12th edition), S. S. Dara, Mukkanti, S. Chand & Co, New Delhi, 2006.
- 7. Chemistry of Engineering Materials (5th edition), C. V. Agarwal, C. P. Murthy, A. Naidu, Wiley India, 2013.
- 8. Chemistry of Engineering Materials (3<sup>rd</sup> edition), R. P. Mani, K. N. Mishra, Cengage Learning, 2015

### **COURSE OUTCOMES:**

After completion of the course students will be able to

- 1. Apply the concept of electrochemistry and corrosion science in various practical applications.
- 2. Predict the different engineering applications by preparing various polymers.
- 3. Summarize the manufacturing process of various fuels and their applications in daily life.
- 4. Understand the benefits of treated water as source in steam generation in industrial application.
- 5. Illustrate the importance and applications of various advanced engineering materials.

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

### (A403301) ENGINEERING MATERIALS

#### **B.Tech I Year II Semester**

L	Т	Р	С
2	0	0	2

# UNIT-I:

Classification of Engineering Materials, Ashby chart, Mechanical Properties of Metals and their testing equipment/procedures, ASTM standards for testing, Stress-Strain Behavior of various materials, Sources of Material Data

# UNIT -II:

Metals and Metal Alloys, Classification of Metal Alloys, Classification, composition, properties and usage of Ferrous alloys, steel, HSS, grey cast iron, white cast iron; Classification, composition, properties and usage of Non-ferrous materials, Aluminum, Titanium, Zinc, Copper, Nickel, Cobalt and their alloys

### UNIT –III:

Composites: Definitions, Reinforcements and matrices, Types of reinforcements, Types of matrices, Classification of composites, Properties of composites in comparison with standard materials Manufacturing methods: Hand and spray lay - up, injection molding, resin injection, filament winding, pultrusion, centrifugal casting and prepregs.

# UNIT – IV:

Ceramics, Classification of ceramic materials, Crystal Structure, Applications and Properties of Ceramics, Ceramic fabrication techniques, Carbon: Diamond and Graphite. Polymer Structures, Chemistry of Polymer Molecules, Classification scheme of polymer molecules, Thermoplastic and Thermosetting Polymers, Characteristics, Applications, and Processing of Polymers, Elastomers

#### UNIT – V:

Materials in nano technology: Semiconductor Nanomaterials (Zinc oxide nano materials, titanium dioxide nanoparticles, Metal nanoparticles, ceramic nano materials metal nano particles (Silver, gold, iron and copper), applications, bio materials and other recent materials

#### **TEXT BOOKS:**

- 1. "Introduction to Engineering Materials",George Murray, Charles V. White, Wolfgang Weise, CRC Press, 2007
- 2. Materials Science and Engineering: An Introduction", William. D. Callister, David G. Rethwisch, "John Wiley & Sons, 2018

#### **REFERENCE BOOKS:**

- 1. Mechanical metallurgy. Vol. 3. Dieter, George Ellwood, and David J. Bacon. New York: McGraw-hill, 1986.
- 2. "Introduction to Physical Metallurgy", Second Edition, Sidney H Avner, McGraw Hill Education,
- 3. "Material Science and Engineering', V. Raghavan, Prentice Hall ofIndia Private Limited, 1999.
- 4. Material Science and Metallurgy. Jindal, U. C. Pearson Education India, 2012.

#### **COURSE OUTCOMES:**

On completion of the course students will be able to

- 1. Classify the various materials that will be essential for the mechanical engineering applications.
- 2. Express the mechanical properties of metals and their testing procedures.
- 3. Understand the applications of Composite materials
- 4. Understand the application of ceramicmaterials and their processing
- 5. Understand the requirement and need for the development of the nano materials.

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

#### (A405202) C PROGRAMMING & DATA STRUCTURES (Common to ECE, EEE, Mech & Civil)

<b>B.Tech I Year II Semester</b>	L	Т	Р	С
	3	0	0	3

# **Course Objectives**

- 1. Introducing a Programming Language
- 2. Familiarizing the students with syntax and semantics of various C- programming language constructs.
- 3. learn to develop solutions to computational problems

#### UNIT-I

Overview of C: Basic structure of C programs, programming style, executing a C program. Constants, Variables, and Data Types:Introduction, Character set, C-Tokens, keywords and identifiers, constants, variables, Data types, declaration of variables, declaration of Storage class, assigning values to variables, defining symbolic constant.

**Operators**& Expressions: Introduction, ArithmeticOperators, RelationalOperators, LogicalOperators, Operators, Assignment Operators, Increment & Decrement Conditional Operators, Bitwise Operator, SpecialOperators. Arithmetic Expressions, Evaluation of Expressions, Precedence of Arithmetic Operators.

#### **UNIT-II**

Decision Making: Introduction, Decision making with if statement, simple if statement, the if--else--statement, Nesting of *if---else---*statements. the *else-if* ladder, the *switch* statement, the ?: operator, the goto statement. Looping: Introduction, the while statement, the do -while statement, for statement, break and continue statements.

Arrays: Introduction, One-Dimensional Arrays, Declaration of One-Dimensional Arrays, Initialization of One-Dimensional Arrays, Two-Dimensional Arrays, Initializing two dimensional arrays.

#### **UNIT-III**

Character Arrays and Strings: Introduction, declaring and initializing string variables, reading strings from terminal, writing strings to screen, string-handling functions. Functions: Introduction, definition of functions, return values, function calls, function declaration, scope, visibility and lifetime of variables. Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self-referential structures in linked list (no implementation)

#### **UNIT-IV**

Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks- Operations, array and linked representations of stacks, stack applications, Queues- operations, array, and linked representations.

#### **UNIT-V**

Searching and Sorting: Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms), Basic concept of order of complexity through the example programs.

#### **TEXTBOOKS:**

- 1. Programming in ANSI C, 8th Edition, E.Balagurusamy McGraw Hill Educationpublication, 2019.
- 2. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.

#### **REFERENCE BOOKS:**

- 1. C Programming Absolute Beginner's Guide, 3<sup>rd</sup> Edition, Pearson Education, 2014
- 2. Learn C the Hard Way,1<sup>st</sup> Edition,Zed A.Shaw, Pearson Education,2018
- 3. The C-Programming Language, 2<sup>nd</sup> Edition, Brian Kernighan and Dennis Ritchie, Pearson Education, 2014
- 4. Data Structures using C A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

### **COURSE OUTCOMES:**

Students shall be able to

- CO1: Describe the structure of C program and explain the various components of it.
- CO2: Use iterative statements for writing the C programs.
- CO3: Organize data in Arrays and perform operations on data stored in Arrays.

CO4: Define & describe user defined functions in C language. CO5: Differentiate structures, unions and manipulate data using pointers.

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

#### (A403202) ENGINEERING GRAPHICS (Commom to Mech & Civil)

#### B.Tech. I Year II Semester

L	Т	Р	С
1	0	3	2.5

# UNIT – I:

**Introduction to Engineering Drawing:** Principles of Engineering Drawing and their Significance, Introduction to Computer aided drafting – views, commands.

Computer aided drafting of conic Sections: Ellipse, Parabola and Hyperbola – General Method (eccentricity) only.

Computer aided drafting of Cycloid, Epicycloids and Hypocycloid. Computer aided drafting of Scales – Plain & Diagonal.

### UNIT-II:

**Orthographic Projections:** Introduction to Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. Computer aided orthographic projections – points, lines and planes

# UNIT – III:

**Projections of Regular Solids:** Introduction to Regular Solids – Prism, Cylinder, Pyramid, Cone Computer aided projections of solids – Regular views

#### UNIT – IV:

Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone, and Computer aided projections of solids – sectional views

**Development of Surfaces:** Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

# UNIT – V:

**Isometric Projections:** Principles of Isometric Projection – Isometric Scale – Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric

Projection of objects having non- isometric lines, Isometric Projection of Spherical Parts using computer aided drafting.

Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions

Conversion of orthographic projection into isometric view and vice versa using computer aided drafting.

#### **TEXT BOOKS:**

1. Engineering Drawing, 51st Edition, N.D. Bhatt, Charotar Pub, 2012

2. Computer Aided Engineering Drawing, 2<sup>nd</sup> Edition, K. Balaveera Reddy et al, CBS Publishers, 2015

#### **REFERENCE BOOKS:**

1. Engineering Drawing, 2<sup>nd</sup> Edition, Basant Agrawal and C M Agrawal, McGraw Hill, 2014

2. Engineering Drawing, 1<sup>st</sup> Edition, M. B. Shah, B.C. Rane, Pearson, 2015

3. Engineering Drawing, 1st Edition, N. S. Parthasarathy and Vela Murali, Oxford, 2015

4. Engineering Drawing and graphics Using AutoCAD, 3<sup>rd</sup> Edition, T. Jeyapoovan, Vikas, S.Chand and Company Ltd, 2000

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

- 1. Apply computer aided drafting tools to create 2D objects like Conic section and Cycloidal curves
- 2. Sketch the Orthographic projection of Point, Line and Plane objects by drafting tools
- 3. Create, read and interpret engineering drawings of Solids by computer tools
- 4. Create and interpret 2D and 3D Isometric objects by drafting tools
- 5. Conversion of orthographic projection into isometric view and vice versa by using computer aided drafting tools

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

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# (A400502) ENGINEERING CHEMISTRY LAB

(Common to all Branches)

# B.Tech. I Year II Semester

#### Lab Experiments:

- 1. Estimation of Hardness of water by EDTA Method.
- 2. Estimation of Alkalinity of Water.
- 3. Estimation of Copper by Colorimetric Method.
- 4. Conductometric Titration of aStrong Acid vs a Strong Base.
- 5. Conductometric Titration of aWeak Acid vs a Strong Base.
- 6. Potentiometric Titration of aStrong Acid vs a Strong Base
- 7. PotentiometricTitration of Ferrous Ammonium Sulphate (FAS) vs Potassium Dichromate.
- 8. Preparation of Thiokol Rubber.
- 9. Determination of Viscosity of a Liquid.
- 10. Determination of Surface Tension of a liquid.
- 11. Adsorption of acetic acid on Activated charcoal.
- 12. Estimation of Iodine in Table Salt (by potentiometric)
- 13. Thin Layer Chromatography (Ortho-Nitro phenol & Para-Nitro phenol).
- 14. Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.

#### Virtual lab experiments:

- 1. Construction of Fuel Cell and its working.
- 2. Smart Materials for biomedical applications.
- 3. Batteries for Electrical Vehicles.
- 4. Functioning of Solar Cell and its applications.

# **REFERENCE BOOKS:**

- 1. Engineering Chemistry Lab Manual (1<sup>st</sup> edition), Glaze Publishers 2018.
- 2. Engineering chemistry (1<sup>st</sup> edition), B. Rama Devi & Ch. VenkataRamana Reddy; Cengage Learning, 2012.
- 3. A Textbook of Engineering Chemistry (1st edition), SashiChawla, DhanapathRai& Sons.

#### **COURSE OUTCOMES:**

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

- 1. Determine the extent of hardness present in water and its consequences in industrial operations
- 2. Prepare polymer like Thiokol Rubber
- 3. Estimate the strength of solutions, p<sup>H</sup> of various solutions
- 4. Determine the viscosity and surface tension of various liquids
- 5. Apply the electrochemical concepts in conductometric and potentiometric titrations

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

# (A403505) FUELS AND LUBRICANTS LABORATORY

# L T P C 0 0 2 1

#### **B.Tech. I Year II Semester**

Prerequisite: Chemistry

Course Objectives: To Understand the fuel and lubricants properties.

#### List of Experiments:

1. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Abels Apparatus

2. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Pensky Martens Apparatus

3. Carbon residue test for Fuels.

4. Determination of Viscosity of Liquid lubricants and Fuels using: Saybolt Viscometer

- 5. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer-I
- 6. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer-II
- 7. Determination of Calorific value: of Gaseous fuels using: Junkers Gas Calorimeter.
- 8. Determination of Calorific value: Solid/Liquid/ fuels using: Bomb Calorimeter.

9. Drop point and Penetration Apparatus for Grease.

10. Distillation Apparatus

11.Cloud and Pour Point Apparatus

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

- 1. Determine the flash point of liquid fuels.
- 2. Determine the fire point, of liquid fuels
- 3. Determine the carbon residue of liquid fuels
- 4. Find the viscosity of lubricants and its variation with temperature
- 5. Determine the calorific value of solid, liquid and gaseous fuels

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

# L T P C 0 0 2 1

# (A405503) C PROGRAMMING & DATA STRUCTURES LAB

(Common to ECE, EEE, Mech and Civil)

# **B.Tech I Year II Semester**

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

# **Course Objectives**

Students will learn the following:

- Work with an IDE to create, edit, compile, run and debug programs
- Analyze the various steps in program development.
- Develop programs to solve basic problems by understanding basic concepts in C like
- Operators, control statements etc.
- Develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- Write programs using the Dynamic Memory Allocation concept.
- Create, read from and write to text and binary files

# I. OPERATORS AND EVALUATION OF EXPRESSIONS

# Demonstration

1. Write a C program to print greetings message on the screen.

- 2. Write a C program to illustrate usage of comments in C.
- 3. Write a simple program that prints the results of all the operators available in C

(Including pre/post increment, bitwise and/or/not. etc), Read required operand values from standard input

4. Write a C program that converts given data type to another using auto conversion and casting. Take the values from standard input.

5. Write a program for finding the max and min from the three numbers (using ternary operator).

#### Experiment

6. Write a C program to compute simple, compound interest.

7. Write a C program that declares Class awarded for a given percentage of marks, where mark = 70% = Distinction.

(Read percentage from standard input.)

# II. Expression Evaluation

# Demonstration

1. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula  $s = ut+(1/2)at^2$  where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec<sup>2</sup> (= 9.8 m/s<sup>2</sup>)).

2. Write a program that asks the user to enter the highest rainfall ever in one season for a country, and the rainfall in the current year for that country, obtains the values from the user, checks if the current rainfall exceed the highest rainfall and prints an appropriate message on the screen. If the current rainfall is higher, it assigns that value as the highest rainfall ever. Use only the single-selection form of the if statement.

# Experiment

3. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

4. Write a C program to find the roots of a Quadratic equation.

# III. Iterative statements

#### Demonstration

1. Write a program that reads an integer (5 digits or fewer) and determines and prints how many digits in the integer are 9s.

2. Write a program that keeps printing the powers of the integer 3, namely 3, 9, 27, 91, 273, and so on. Your loop should not terminate (i.e., you should create an infinite loop). What happens when you run this program? 3. Write a program that reads the radius of a circle (as a float value) and computes and prints the diameter, the circumference and the area. Use the value 3.14159 for  $\pi$ 

# Experiment

4. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

5. Write a C program to construct a pyramid of numbers as follows:

1					1				
1	2				2	2			
1	2	3			3	3	3		
1	2	3	4		4	4	4	4	
1	2	3	4	5	5	5	5	5	5

# **IV. Arrays, Pointers, and Functions**

# Demonstration

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

2. Write a function to compute mean, variance, Standard Deviation, sorting of n elements in a single dimension arrav.

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

i. Addition of Two Matrices, ii. Multiplication of Two Matrices, iii. Transpose of a matrix.

# Experiment

- 4. Write a C program to find the GCD (greatest common divisor) of two given integers.
- 5. Write a C program to compute  $x^n$

# V. Strings

# Demonstration

- 1. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
- 2. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent c.
- 3. Write a C program that uses functions to perform the following operations:
  - To insert a sub-string into a given main string from a given position.
  - To delete n Characters from a given position in a given string.

# Experiment

4. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)

- 5. Write a C program that displays the position of a character ch in the string S or -1 if S doesn't contain ch.
- 6. Write a C program to count the lines, words and characters in a given text.

# **VI Data Structures**

# **Demonstration**

- 1. Write a program that uses functions to perform the following operations on singly linked list i) Creation, ii) Insertion, iii) Deletion and iv) Traversal
- 2. Write a program that implement stack (its operations) using
  - i) Arrays, ii) Pointers
- 3. Write a program that implement Queue (its operations) using i) Arrays, ii) Pointers

# Experiment

- 4. Write a program that uses functions to perform the following operations on doubly linked List. i) Creation ii) Insertion iii) Deletion iv) Traversal
- 5. Write a program that uses functions to perform the following operations on circular linked List. i) Creation ii) Insertion iii) Deletion iv) Traversal

# **VII Searching & Sorting**

#### Demonstration

1. Write a C program that uses non recursive function to search for a Key value in a given list of integers using linear search method.

2. Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers using binary search method.

3. Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order. Experiment

- 4. Write a C program that sorts the given array of integers using selection sort in descending order
- 5. Write a C program that sorts the given array of integers using insertion sort in ascending order

# **TEXTBOOKS:**

1) Programming in ANSI C, 8th Edition, E. Balagurusamy McGraw Hill Education publication, 2019

2) Fundamentals of Data Structures in C, 2 nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.

### **REFERENCE BOOKS:**

- 1) C Programming Absolute Beginner's Guide, 3<sup>rd</sup> Edition, Pearson Education, 2014
- 2) Learn C the Hard Way,1<sup>st</sup> Edition, Zed A. Shaw, Pearson Education,2018
- The C-Programming Language, 2<sup>nd</sup> Edition, Brian Kernighan and Dennis Ritchie, Pearson Education, 2014.
- 4) Data Structures using C A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

### **COURSE OUTCOMES:**

Students shall be able to:

CO1: formulate the algorithms for simple problems and translate given algorithms to a working and correct program

CO2: correct syntax errors as reported by the compilers identify and correct logical errors encountered during execution

CO3: represent and manipulate data with arrays, strings and structures and

CO4: Develop applications using pointer concept.

CO5: Develop reusable code with the help C-functions

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

#### (A400506) ENGINEERING EXPLORATION & PRACTICE (Common to all branches)

L	Т	Р	С
0	0	3	1.5

# **B.Tech I Year II Semester**

### Week-1

Difference between Science and Engineering, Scientist and Engineer needs and wants various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer. Significance of teamwork, Importance of communication in engineering profession

# Week-2

Engineering Design Process, Need statement to Problem conversion, Pair wise comparison chart, decision matrix, Concepts of reverse engineering

#### Week-3

Project management tools: Checklist, Timeline, Gantt chart, Requirement Analysis

Week-4

Basic Components of a Mechanism, Degrees of Freedom or Mobility of a Mechanism, 4 Bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism

#### Week-5

3-D Modelling of a Box with two holes and curvature

#### Week-6

3-D Modelling of Electronic Enclosure and Assembly of two parts

#### Week-7

Introduction to various platform-based developments, Introduction to basic components, transducers, actuators and sensors, Introduction to Tinkercad

#### Week-8

Introduction to Arduino, basics of programming

Week-9

Interfacing Arduino with actuators and transducers

Week-10

Interfacing Arduino with Sensors, Liquid Crystal Display (LCD)

Week-11

Assembly and Crafting the Prototype

Week-12

Test and Validate the Prototype, Documentation, and Panel Presentation

#### **TEXT BOOKS:**

- 1. Engineering Fundamentals: An Introduction to Engineering (MindTap Course List) 5th Edition by Saeed Moaveni
- 2. Software Project Management (SIE), (Fifth Edition); Bob Hughes, MikeCotterell, Rajib Mall; Published by Tata McGraw-Hill Education Pvt. Ltd (2011); ISBN 10: 0071072748 ISBN 13: 9780071072748
- 3. A Ghosh and AK Malik: Theory of Mechanism and Machine; East West Press (Pvt) Ltd., New Delhi.
- 4. Arduino Cookbook, 2nd Edition by Michael Margolis: O'Reilly Media
- 5. Introduction to autocad®2017-2D and 3D design by Bernd S. Palm and Alf Yarwood, Routledge (Taylor and Francis group)
- 6. Concepts in Engineering Design 2016; by Sumesh Krishnan (Author), Dr.Mukul Shukla (Author), Publisher: Notion Press.

# **COURSE OUTCOMES:**

On Completion of the course, the students will be able to

- 1. Explain the importance of engineering profession in the world.
- 2. Identify multi-disciplinary approach required in solving an engineering problem
- 3. Build a mechanism for a given application
- 4. Create basic 3D models and animations
- 5. Design a mechatronic system using Arduino and electronic components

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

### (A400703) CONSTITUTION OF INDIA (Common to all branches)

L T P C 2 0 0 0

# **B.Tech I Year II Semester**

### UNIT - 1

History of Making of the Indian Constitution - History of Drafting Committee

### UNIT - 2

Philosophy of the Indian Constitution - Preamble Salient Features

#### UNIT - 3

Contours of Constitutional Rights & Duties - Fundamental Rights

- ➢ Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

#### UNIT - 4

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

#### UNIT - 5

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO ZilaPanchayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

#### **REFERENCE BOOKS:**

- 1) The Constitution of India, 1950 (Bare Act), Government Publication.
- 2) Dr. B. R. Ambedkar framing of Indian Constitution, Dr. S. N. Busi, 1<sup>st</sup> Edition, 2015.
- 3) Indian Constitution Law (7<sup>th</sup> Edition), M. P. Jain, Lexis Nexis, 2014.
- 4) Introduction to the Constitution of India, D.D. Basu, Lexis Nexis, 2015.

#### **COURSE OUTCOMES:**

On completion of the course students will be able to

- 1) Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- 2) Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- 3) Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru.
- 4) Discuss the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
- 5) Discuss the passage of the Hindu Code Bill of 1956.

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

L T P C 3 0 0 3

#### (A403305) MECHANICS OF SOLIDS (Common to all branches)

### B.Tech II Year I Semester

Course Pre-Requisites: Engineering Mechanics

#### UNIT – I:

**Simple Stresses & Strains:** Elasticity and plasticity – Types of stresses & strains–Hooke's law– stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic moduli & 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 cantilever, 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/RNeutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

**Shear Stresses:** 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.

**Columns and Struts:** Euler's Theory, Limitations of Euler's theory, Equivalent Length, Rankine's Formula, Secant Formula.

#### **TEXT BOOKS:**

- 1. Egor P. Popov, Toader A. Balan, "Engineering Mechanics of Solids", PHI Learning, 2010Barry J.
- 2. S. S. Rattan, "Strength of Materials", Second Edition Tata McGraw Hill Education Pvt. Ltd, New Delhi,2011

#### **REFERENCE BOOKS:**

- 1. U. C. Jindal, "Strength of Materials", Pearson Education India, 2012
- 2. Goodno and James M. Gere, "Mechanics of Materials" Ninth Edition, Cengage Learning, 2018.
- 3. G. H. Ryder, "Strength of Materials", Macmillan Long Man Publications, 1961
- 4. W. A. Nash and M. C. Potter, "Strength of Materials", Fifth Edition, Schaum's Outline Series, 2011

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

- 1. Evaluate the internal forces, moments, stresses, strains, and deformations in structures made of various materials acted on by a variety of loads.
- 2. Draw axial force, shear force and bending moment diagrams for beams and frames.
- 3. Develop the Bending and Torsion formula and apply to the design of beams and shafts.
- 4. Use the stress transformation equations to find the state of stress at a point for various rotated positions of the stress element and display the same in graphical form as Mohr's circle.
- 5. Understand the different criteria for the safety of the component by applying the theories of elastic failure.

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

### (A403303) METALLURGY & MATERIAL SCIENCE

### B. Tech. (ME) II Year I Semester

L	Т	Р	С
3	0	0	3

### UNIT – I

Crystal Structure: Unit cells, Metallic and Ceramic crystal structures. Imperfection in solids: Point, line, surface and volume defects; dislocations, strengthening mechanisms, slip systems, critical resolved shear stress.

# UNIT – II

Hume – Rothery Rules: Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, Eutectiod, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and micro structural aspects of ledeburite, austenite, pearlite, ferrite and cementite.

# UNIT –III

Heat treatment of steels: Isothermal transformation diagrams for Fe-C alloys and microstructures development. Martensite, Bainite. Annealing. Normalising, Hardening, Tempering and Spheroidising.

#### UNIT – IV

Continuous cooling curves and interpretation of final microstructures and properties-Thermo mechanical treatments like austempering, martempering, surface hardening methods like case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening

# UNIT – V

Alloy steels, properties and applications of stainless steels and tool steels, maraging steels- Types of cast irons (grey, white, malleable and spheroidal graphite cast irons), copper and its alloys (Brass and bronze)- Aluminium and its alloys (Al-Cu Alloys). Ceramics and Composites: Types, properties and applications.

#### **TEXT BOOKS:**

- 1. V. Raghavan, "Material Science and Engineering', Prentice Hall of India Private Limited, Fifth Edition.
- 2. William. D. Callister, David G. Rethwisch, "Materials Science and Engineering: An Introduction", John Wiley & Sons, 2018.
- 3. Sidney H Avner, Introduction to Physical Metallurgy, McGraw Hill, 2017

#### **REFERENCE BOOKS:**

- 1. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 9th Edition, Indian Reprint, 2009.
- 2. U. C. Jindal, "Engineering Materials and Metallurgy", Pearson, 2011.
- Course Outcomes: At the end of the course, student will be able to
- 1. Memorize the types of Crystal structures and their defects.
- 2. Learn the necessity of alloying and identify types of alloy phases.
- 3. Demonstrate importance of critical understanding of heat treatment in achieving required properties.
- 4. Apply the knowledge of heat treatment to enhance surface properties.
- 5. Analyze the properties and micro structure of ferrous and non-ferrous alloys.
- 6. Develop new materials and enhance properties for the advanced applications.

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

(A403304) THERMODYNAMICS

B. Tech. (ME) II Year I Semester

L	Т	Р	С
3	0	0	3

**Note: 1.** Steam Tables are permitted for examinations. 2. Refrigeration and psychrometry Tables are permitted for examinations.

### UNIT-I

Introduction: 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 – variable specific Heats – Gas Tables

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, Brayton and Rankine cycles – Performance Evaluation. **Refrigeration Cycles:** Bell-Coleman cycle, Vapour compression cycle-performance Evaluation. **TEXT BOOKS**:

#### **TEXT BOOKS:**

- 1. Engineering Thermodynamics / PK Nag / Mc Graw Hill
- 2. Thermodynamics An Engineering Approach by Yunus A. Cengel & Michael A. Boles, TMH
- 3. Fundamentals of Classical Thermodynamics by G. Van Wylan & R.E. Sonntag, John Wiley Pub

#### **REFERENCE BOOKS:**

- 1. Engineering Thermodynamics by Jones & Dugan, PHI, 2007.
- 2. Thermodynamics by M. Achutan, PHI, 2nd Edition, 2013.
- 3. Thermodynamics & Heat Engines by R. Yadav, Central Book Depot, Allahabad.
- 4. Thermodynamics by S.C. Gupta, Pearson Publications.

#### **COURSE OUTCOMES:**

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

- 1. Understand the basics of Thermodynamics
- 2. Apply first and second laws of thermodynamics to different systems
- 3. Determine the feasibility of a process w.r.to entropy changes
- 4. Apply concepts of thermodynamic property relations to ideal gas and real gases

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

5. Evaluate performance of power cycles and refrigeration cycles

#### (A401201) FLUID MECHANICS & HYDRAULIC MACHINES Common to B.Tech (ME) and B.Tech. (EEE)

# B. Tech. (ME) II Year I Semester

L	Т	Р	С
3	0	0	3

# UNIT – I:

**Fluid statics:** Dimensions and units: physical properties of fluids- specific gravity, viscosity, and surface tension - vapour pressure and their influence on fluid motion- atmospheric, gauge and vacuum pressures – measurement of pressure- Piezometer, U-tube and differential manometers.

# UNIT – II:

**Fluid Kinematics:** Stream line, path line and streak lines and stream tube, classification of flows, steady & unsteady, uniform & non-uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three-dimensional flows.

**Fluid Dynamics:** Surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

#### UNIT – III:

**Boundary Layer Concepts:** Definition, thicknesses, characteristics along thin plate, laminar and turbulent boundary layers (No derivation) boundary layer in transition, separation of boundary layer, submerged objects – drag and lift.

**Closed conduit flow:** Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line. **Measurement of flow:** Pitot tube, venturi meter, and orifice meter, Flow nozzle

# UNIT – IV:

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

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

#### UNIT – V:

**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. Hydraulics, Fluid mechanics and Hydraulic Machinery - Modi and Seth, 21st Edition, standard Book House.

2. Fluid Mechanics and Hydraulic Machines by Er. R. K. Rajput, S. Chand, 2019.

#### **REFERENCE BOOKS:**

- 1. Fluid mechanics and fluid power engineering by d.s. kumar, s.k. kataria & sons,2018
- 2. Fluid mechanics and machinery by d. rama durgaiah, new age international publishers
- 3. Hydraulic machines by t.r.banga & s.c. sharma, 7 th edition, khanna publishers

Course Outcomes: At the end of the Course, student will be

- 1. Able to explain the effect of fluid properties on a flow system.
- 2. Able to identify type of fluid flow patterns and describe continuity equation.
- 3. Able To analyze a variety of practical fluid flow and measuring devices and utilize Fluid Mechanics principles in design.
- 4. Able To select and analyze an appropriate turbine with reference to given situation in power plants.
- 5. To estimate performance parameters of a given Centrifugal and Reciprocating pump.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												

B.Tech(ME) R-22

CO3						
CO4						
CO5						

#### (A402204) BASIC ELECTRICAL & ELECTRONICS ENGNEERING (FOR CIVIL & MECHANICAL)

L	Т	Р	С
3	0	0	3

#### B.Tech (Mech& Civil) –III SEM

# UNIT - I:

#### **D.C.** Circuits:

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation.

**A.C. Circuits:** Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits, Threephase balanced circuits, voltage and current relations in star and delta connections.

#### **UNIT - II: Electrical Installations:**

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

**UNIT - III: Electrical Machines:** Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three-phase transformer connections. Construction and working principle of DC generators, EMF equation, working principle of DC motors, Torque equations and Speed control of DC motors, Construction and working principle of Three-phase Induction motor, Torques equations and Speed control of Three-phase induction motor. Construction and working principle of synchronous generators.

**UNIT - IV: P-N Junction and Zener Diode:** Principle of Operation Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications. 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 - V: Bipolar Junction Transistor (BJT):** Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations.

Field Effect Transistor (FET): Construction, Principle of Operation, Comparison of BJT and FET, Biasing FET.

#### **TEXT BOOKS:**

- 1. Basic Electrical and electronics Engineering -M S Sukija TK Nagasarkar Oxford University
- 2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

#### **REFERENCE BOOKS:**

- 1. Electronic Devices and Circuits R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
- 2. Millman's Electronic Devices and Circuits J. Millman and C. C. Halkias, SatyabrataJit, TMH, 2/e, 1998.
- 3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
- Linear circuit analysis (time domain phasor and Laplace transform approaches) 2 nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
- 5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
- 6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
- 7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011. 8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
- 8. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

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

- 1. To analyze and solve electrical circuits using network laws and theorems.
- 2. To understand and analyze basic Electric and Magnetic circuits
- 3. To study the working principles of Electrical Machines
- 4. To introduce components of Low Voltage Electrical Installations
- 5. To identify and characterize diodes and various types of transistors.

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

# (A402504)BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

#### B.Tech. III SEM

L	Т	Р	С
0	0	2	1

#### Pre-requisites: Basic Electrical and Electronics Engineering Course Objectives:

- 1. To introduce the concepts of electrical circuits and its components
- 2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- 3. To study and understand the different types of DC/AC machines and Transformers.
- 4. To import the knowledge of various electrical installations.
- 5. To introduce the concept of power, power factor and its improvement.
- 6. To introduce the concepts of diodes & transistors, and
- 7. To impart the knowledge of various configurations, characteristics and applications.

#### List of Experiments/ Demonstrations:

#### PART A: ELECTRICAL

- 1. Verification of KVL and KCL
- 2. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
- 3. Measurement of Active and Reactive Power in a balanced Three-phase circuit
- 4. Performance Characteristics of a DC Shunt Motor
- 5. Performance Characteristics of a Three-phase Induction Motor
- 6. No-Load Characteristics of a Three-phase Alternator

### **PART B: ELECTRONICS**

- 1. Study and operation of (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO.
- 2. PN Junction diode characteristics
- 3. Zener diode characteristics and Zener as voltage Regulator 4. Input & Output characteristics of Transistor in CB / CE configuration
- 4. Full Wave Rectifier with & without filters
- 5. Half Wave Rectifier with & without filters

#### **TEXT BOOKS:**

- 1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
- 2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

#### **REFERENCE BOOKS:**

- 1. Electronic Devices and Circuits R. L. Boylestead and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
- 2. Millman's Electronic Devices and Circuits J. Millman and C. C. Halkias, SatyabrataJit, TMH, 2/e, 1998.

#### **Course Outcomes:**

- 1. To analyze and solve electrical circuits using network laws and theorems.
- 2. To understand and analyze basic Electric and Magnetic circuits
- 3. To study the working principles of Electrical Machines
- 4. To introduce components of Low Voltage Electrical Installations
- 5. To identify and characterize diodes and various types of transistors.

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

# (A401506) FLUID MECHANICS AND HYDRAULICS MACHINERY LABORATORY

# **B.Tech. III SEM**

# L T P C 0 0 2 1

# List of Experiments

- 1. Verification of Bernoulli's equation
- 2. Determination of Coefficient of discharge for a small orifice by a constant head method
- 3. Calibration of Venturimeter / Orifice Meter
- 4. Calibration of Triangular / Rectangular/Trapezoidal Notch
- 5. Determination of Minor losses in pipe flow
- 6. Determination of Friction factor of a pipe line
- 7. Determination of Energy loss in Hydraulic jump
- 8. Determination of Manning's and Chezy's constants for Open channel flow.
- 9. Impact of jet on vanes
- 10. Performance Characteristics of Pelton wheel turbine
- 11. Performance Characteristics of Francis turbine
- 12. Performance characteristics of Keplan Turbine
- 13. Performance Characteristics of a single stage / multi stage Centrifugal Pump
- 14. Study of Water Hammer due to sudden closure of valve

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

- 1. determine the coefficient of discharge for venture meter, orifice meter and small orifice meter
- 2. perform the various notches and assess the losses in pipes
- 3. verify the Bernoulli's equation and study the flow in open channel
- 4. analyze the performance of pumps, various turbines and effect of water hammer
- 5. calculate impact of force of Jet on different types of Vanes

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	P08	PO9	PO10	PO11	PO12
CO1	3	3	-	-	-	-	-	-	-	-	-	3
CO2	3	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	-	-	-	-	-	-	-	-	-	3
CO4	3	3	-	-	-	-	-	-	-	-	-	3
CO5	3	3	-	-	-	-	-	-	-	-	-	3

# (A405506) PYTHON PROGRAMMING LABORATORY

(Common to CSE, ECE, IT, CSE-DS, CSE-AI&ML, AI&ML, AI&DS, CSE-CS, MECH, CIVIL, EEE)

#### B. Tech. (ME) II Year I Semester

# L T P C 0 1 2 2

# **Course Objectives**

- To train the students in solving computational problems
- To elucidate solving mathematical problems using Python programming language.
- To understand the fundamentals of Python programming concepts and its applications.
- To understand the object-oriented concepts using Python in problem solving.

# **Course Outcomes**

Students shall be able to:

CO1Design solutions to computational problems using Python programming language constructs. CO2Write python programs to manipulate string objects.

CO3Use appropriate Data structures to organize and manipulate data items.

CO4Design modular application using python module & package concepts.

CO5Develop application to read and write from various file formats.

# Week 1.

(Python Language Fundamentals-Installation -Identifiers, Reserved Words, Data Types, Type Casting, Immutability)

#### Demonstration

Experiment-1: Install Anaconda open-source framework for python. Experiment-2: Write a program to display 'Hello World'.

#### Experimentation

Experiment-3: Explore various IDEs for python program development. Experiment-4: The volume of a sphere with radius r is  $4/3 \pi r^3$ . Write a Python program to find the volume of a sphere with

radius 5?

#### Week 2.

(Arithmetic Operators, Relational Operators, Logical operators, Bitwise operators, Assignment operators, Special operators)

#### Demonstration

Experiment-1; Write a python program to find minimum and maximum of given three numbers. Experiment-2: Suppose the cover price of a book is \$24.95, but bookstores get a 40% discount. Shipping costs \$3 for the first copy and 75 cents for each additional copy. Write a python program to compute the total wholesale cost for 60 copies?.

#### Experimentation

Experiment-3: Write a Python Program to Find the Square Root of a number with out using sqrt function. Experiment-4: Python Program to Convert Celsius To Fahrenheit. Experiment-5: Python program to find themaximum of two numbers using ternary operator

#### Week 3.

(Mathematical Functions, Input and Output statements, Command Line Arguments, String Functions) **Demonstration** 

Experiment-1: Write a Python program to find area of circle.

Experiment-2: Write a program to read Employee data from the keyboard and print that data.

#### Experimentation

Experiment-3: Write a program to read 3 float numbers from the keyboard with comma separator and print their sum.

Experiment-4: Write a Program to display Command Line Arguments.

#### Week 4.

(Flow Control Statements-Conditional Statements, Transfer Statements, Iterative Statements)

#### Demonstration

Experiment-1. Write a Python program to take a single digit number from the key board and print is value in English word?.

Experiment-2. Write a Python Program to check whether an n-digit integer is an Armstrong number or not.

### Experimentation

Experiment-3. Write a Python program to display \*'s in pyramid style(also known as equivalent triangle). Experiment-4. Write a Python Program to Display the multiplication Table. **Week 5.** 

(Functions-Built in functions, user defined functions, Parameters, return statement, returning multiple values from function, type of arguments, Types of variables-global, local. Recursive functions, Lambda functions, filter function, reduce function, Function aliasing, Function decorators, Generators)

#### Demonstration

Experiment-1: Write a python function to find factorial of given number?

Experiment-2: Write a program to create a lambda function to find square of given number?

#### Experimentation

Experiment-3: Lambda Function to find biggest of given values.

Experiment-4:Program to filter only even numbers from the list by using filter() function? **Week 6.** 

(Working with Strings-Defining String, Multi-line Strings, Accessing characters of a string, Mathematical operators for strings, Membership operator, Comparison of Strings, Removing spaces from the string, Finding Substring, String replacement, Splitting of Strings, Changing cases of a string, Formatting the strings)

### Demonstration

Experiment-1: Write a program to accept some string from the keyboard and display its characters by index wise(both positive and negative index).

Experiment-2: Write a program to access each character of string in forward and backward direction by using while loop?

#### Experimentation

Experiment-3: Program to display all positions of substring in a given main string.

Experiment-4: Write a program to reverse the given String.

### Week 7.

(Python Data Structures-List: Creating a list-Accessing elements of a List, Traversing the List, List Manipulation, Ordering the elements of a List, Mathematical Operators for List objects, Membership Operator, Nested Lists, List Comprehensions)

#### Demonstration

Experiment-1:Write a Python program to display unique vowels present in the given word.

Experiment-2: Write a Python program to Count the Occurrence of an Item in a List.

#### Experimentation

Experiment-3: Write a Python program to segregate even and odd numbers from the given list of numbers. Experiment-4: Write a Python program to find the cumulative sum of elements of the list.

#### Week 8.

(Python Data Structures-Tuple: Creating a Tuple, Accessing the elements of a tuple, mathematical operators for tuple,

#### *Tuple packing and Unpacking)*

#### Demonstration

Experiment-1: Python program for adding a Tuple to List and Vice-Versa.

Experiment-2: Write a Python program to perform the summation of all elements of each tuple from the list of tuples.

#### Experimentation

Experiment-3: Write a Python program to multiply adjacent elements of a tuple.

Experiment-4: Write a Python program to find the maximum element in the tuple list.

#### Week 9.

(Python Data Structures-Set: Creating a Set object, functions of set, Mathematical operations on set, Membership Operators, Set Comprehension, Python Data Structures-Dictionary: Creating a Dictionary Object, accessing data from the dictionary, updating dictionaries, Deleting from dictionary, Functions on dictionary, dictionary comprehension)

# Demonstration

Experiment-1.Write a Python program to perform set operations.

Experiment-2:Write a program to print different vowels present in the given word?

Experiment-3: Write a Python program to generate powers of 2 using set comprehensions.

Experiment-4: Write a program to eliminate duplicates present in the list using set

Experiment-5: Write a Python program to enter name and percentage marks in a dictionary and display information on the console.

# Experimentation

Experiment-6: Write a program to take dictionary from the keyboard and print the sum of values?

Experiment-7: Write a program to find number of occurrences of each letter present in the given string using dictionary.

Experiment-8: Write a program to accept student name and marks from the keyboard and creates a dictionary. Also display student marks by taking student name as input?

#### Week 10.

(Python Modules-Creating Modules, Accessing members, module aliasing, member aliasing, reloading a module, The special variable: \_\_name\_\_\_. Working with Math, random modules, Python Packages. Python-File Handling-Types of Files, Opening a file, closing a file, properties of File object, writing data to text file, Reading character data from text files, seek (), tell() functions.)

### Demonstration

Experiment-1:Create a module **fibo.py** containing Fibonacci(**n**) function(s) and import fibo module in a python script to print Fibonacci series upto**n**.

Experiment-2: Write a python program to print all the contents of a given module.

Experiment-3:Write a python program to create a package containing two or modules.

Experiment-4: Write a python program to import module from a package created in Experiment-3.

# Experimentation

Experiment-5: Write a program to check whether the given file exists or not. If it is available then print its content?

Experiment-6: Write a python Program to print the number of lines, words and characters present in the given file?

Experiment-7: Program to read image file and write to a new image file?

Experiment-8: Write a python program to read and write to a CSV file.

#### Note:

*Experiments under Demonstration section are to be demonstrated by the concerned faculty and the experiments under Experimentation section must be performed by the students individually.* 

#### **Reference Books:**

1.Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.

2. Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.

3. Kenneth A. Lambert, B.L. Juneja, "Fundamentals of Python", CENGAGE, 2015.

4. R. Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019.

# Web links:

- 1. <u>https://docs.python.org/3/tutorial/modules.html#packages</u>
- 2. <u>https://www.includehelp.com/python/programs.aspx</u>.
- 3. https://www.anaconda.com/products/individual
- 4. https://www.jetbrains.com/pycharm/

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

# (A400507) SOCIAL INNOVATION IN PRACTICE

# B.Tech. II Year I Sem.

	L	Т	Р	С
	0	0	2	1
Week-1				
Identify community issues to be addressed, Requirements Analysis: Extensive User requ	uiremer	nts anal	ysis	
Week-2				
Generating effective System Requirement document				
Week-3				
Social Innovation - Case Studies				
Week-4				
Impact of Social Innovation on communities				
Week-5				
Process of Social Innovation Prompts - identifying needs, Proposals -generating ideas,				
Prototyping – testing the ideain practice,				
Week-6				
Sustaining-developing a business model, Scaling and diffusion-growing social innovation	ons, Sys	stemati	c chang	ge
Week-7				
Introduction to sustainability, Sustainability leadership, Life cycle assessment				
Week-8				
Carbon footprint Calculation				
Week-9				
Types of Start-Ups, Types of business models, Market risksand Marketing strategies				
Week-10				
Verification of Business Model and Validation				
Week-11				
Business Model Development				
Week-12				
Documentation and Panel presentation				

#### **Course Outcomes**

On Completion of the course, the students will be able to

- 1. Identify several social issues to be addressed
- 2. Analyse the impact of social innovations on the society
- 3. Illustrate the process of social innovation for a community problem
- 4. Demonstrate the solution from sustainability perspectives.
- 5. Develop a scalable business model.

### **Reference Books**

- 1. Requirements Analysis: From Business Views to Architecture; David C. Hay; Prentice Hall Professional
- 2. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, YeheskelHasenfeld; Palgrave Macmillan
- 3. Social Enterprise Law: Trust, Public Benefit and Capital Markets By Dana Brakman Reiser & Steven A. Dean
- 4. Introduction to Sustainability by Robert Brinkmann, Wiley-Blackwell

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

# (A400702) GENDER SENSITIZATION (Common to all branches)

B. Tech. (ME) II Year I Semester

 $\begin{array}{ccccc} L & T & P & C \\ 0 & 0 & 2 & 0 \end{array}$ 

#### **UNIT-I: UNDERSTANDING GENDER**

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

#### **UNIT – II: GENDER ROLES AND RELATIONS**

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

#### **UNIT – III: GENDER AND LABOUR**

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn"t Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.-GenderDevelopment Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

#### **UNIT - IV: GENDER - BASED VIOLENCE**

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

# **UNIT - V: GENDER AND CULTURE**

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

#### **REFERENCE BOOKS**

1. Towards a World of Equals: A Bilingual Textbook on Gender, A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, VasudhaNagaraj, AsmaRasheed, GoguShyamala, DeepaSreenivas and Susie Tharu published by Telugu Akademi, Telangana Government, 2015.

#### **Course Outcomes:**

On completion of the course students will be able to

- 1. Students will have developed a better understanding of important issues related to gender in contemporary India.
- 2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legalaspects of gender. (This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film).
- 3. Students will attain a finer grasp of how gender discrimination works in our society and acquire insight into the gendered divisin of labour and its relatuion to politics and economics.
- 4. Men and women students and professionals will be better equipped to work and live together as equals.
- 5. Students will develop a sense of appreciation of women in all walks of life by going through accounts of studies and movements as well as the new laws that provide protection and relief to women.

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

### (A403307) KINEMATICS OF MACHINERY

B. Tech. (ME) II Year II Semester

L	Т	Р	С
3	1	0	4

### UNIT – I

**Mechanisms:** Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – Types of constrained motion – completely, partially or successfully and incompletely constrained motion. **Mechanism and Machines** – Mobility of Mechanisms: Grubler's criterion, classification of machines – bispartice pairs – for a classification of machines – Mobility of Mechanisms: Grubler's criterion, classification of machines – bispartice pairs – bispartice

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 of Velocity and acceleration – Graphical method – Application of relative velocity method. **Plane motion of body:** Instantaneous center of rotation- centrodes and axodes – Three centers in line theorem – Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method. Klien's construction – Corioli's acceleration - determination of Corioli's component of acceleration

**Analysis of Mechanisms:** Analysis of slider crank chain for displacement, velocity and acceleration 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 steering gear. **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 Tangent cam with Roller follower.

#### UNIT – V

**Higher pair:** Friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion – velocity of sliding. Forms of teeth, cycloidal and involutes profiles – phenomena of interference – Methods of avoiding 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

#### **TEXT BOOKS**

1. Rattan, Sarjit S. Theory of machines. Tata McGraw-Hill Education, 2014.

2. Uicker, John Joseph, Gordon R. Pennock, and Joseph Edward Shigley. Theory of machines and mechanisms. Vol. 1. New York, NY: Oxford University Press, 2011.

#### **REFERENCE BOOKS**

- 1. Thomas, Bevan. Theory of Machines, 3/e. Pearson Education India, 1986.
- 2. Khurmi R.S., Theory of Machines, S Chand Publishers
- 3. Rao, J. S., Dukkipati, R.V., Mechanism and Machine Theory, New age International Publishers, 1992.

### **COURSE OUTCOMES:**

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

- 1. Analyze the mobility concepts of machines & mechanisms.
- 2. Analyze for velocity & acceleration on various mechanisms.
- 3. Analyze various motion mechanisms.
- 4. Design cam profiles and analyze for resulting follower motions on specified contours.
- 5. Design and analyze various power transmission drives.
|     | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| C01 |     |     |     |     |     |     |     |     |     |      |      |      |
| CO2 |     |     |     |     |     |     |     |     |     |      |      |      |
| CO3 |     |     |     |     |     |     |     |     |     |      |      |      |
| CO4 |     |     |     |     |     |     |     |     |     |      |      |      |
| CO5 |     |     |     |     |     |     |     |     |     |      |      |      |

### (A403306) IC ENGINES AND GAS TURBINES

#### B. Tech. (ME) II Year II Semester

L	Т	Р	С
3	0	0	3

**Note: 1.** Steam Tables are permitted for examinations.

2. Refrigeration and psychrometry Tables are permitted for examinations.

### 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

## $\mathbf{UNIT} - \mathbf{IV}$

Rotary Compressor (Positive displacement type): Roots Blower, vane sealed 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.

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.

# UNIT – V:

**Gas Turbines:** Simple Gas Turbine Plant – Ideal Cycle – Closed Cycle and Open Cycle for Gas Turbines, Constant Pressure Cycle, Constant Volume Cycle, Efficiency – Work Ratio and Optimum Pressure Ratio for Simple Gas Turbine Cycle. Parameters of Performance, Actual Cycle.

### **TEXT BOOKS:**

1. Ganesan, V. Internal combustion engines. McGraw Hill Education (India) Pvt Ltd, 2012.

2. Rajput, R. K. Thermal engineering. Laxmi Publications, 2010.

### **REFERENCE BOOKS**

1. Nag, P. K. Engineering thermodynamics. Tata McGraw-Hill Education, 2013.

2. Mathur, M. L., and R. P. Sharma. Internal combustion engines. Dhanpat Rai Publ., 2005.

3. Pulkrabek, Willard W. Engineering fundamentals of the internal combustion engine. Upper Saddle River: Pearson Prentice Hall, 2014.

4. Rudramoorthy, R. Thermal engineering. Tata McGraw-Hill, 2003.

5. Heywood, John B. "Internal combustion engine fundamentals." (1988).

6. Khurmi, R. S., and J. K. Gupta. A Textbook of Thermal Engineering (Mechanical Technology). S. Chand, 2008.

### **COURSE OUTCOMES:**

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

- 1. Classify the working principles of internal combustion engines.
- 2. Compare combustion phenomena between SI Engines & CI engines.
- 3. Estimate the performance parameters of internal combustion engines.
- 4. Analyze the performance of compressors.
- 5. Demonstrate basic concepts of refrigeration, psychometric properties and air conditioning systems.

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

### (A400006) PROBABILITY, STATISTICS & COMPLEX VARIABLES

### B.Tech (ME): II Year II Sem

L	Т	Р	С
3	1	0	4

### **UNIT-I:Basic Probability**

 $\label{eq:probability_spaces} Probability, independent events, and Baye's theorem.$ 

Random variables: Discrete and continuous random variables, Expectation of Random Variables, Varianceofrandom variables

#### UNIT-II:Probabilitydistributions

Binomial,Poisson,evaluationofstatistical parametersforthesedistributions,Poissonapproximationtothe binomial distribution, Continuous random variables and their properties, distribution functions and density functions, Normaland exponential, evaluation of statistical parameters for these distributions

#### UNIT-III: Estimation & Testsof Hypotheses

Introduction, Statistical Inference, Classical Methods of Estimation.: Estimating the Mean, StandardError of a Point Estimate, Prediction Intervals, Estimating a Proportion for single sample, DifferencebetweenTwo Means, difference betweentwo proportionsfortwo Samples.

#### StatisticalHypotheses:

General Concepts, Testing a Statistical Hypothesis, Tests Concerning a Single Mean, Tests on Two Means, Testona Single Proportion, Two Samples: Tests on Two Proportions.

#### **UNIT-IV:ComplexDifferentiation**

Limit, Continuity and Differentiation of Complex functions, Analyticity, Cauchy-Riemann equations(without proof), finding harmonic conjugate, elementary analytic functions (exponential, trigonometric,logarithm) and their properties.

#### **UNIT-V:ComplexIntegration**

Line integral, Cauchy's theorem, Cauchy's Integral formula, Zeros of analytic functions, Singularities, Taylor'sseries, Laurent'sseries, Residues, Cauchy Residue theorem (Alltheoremswithout Proof).

### **TEXTBOOKS:**

- 1. B.S.Grewal, HigherEngineeringMathematics, KhannaPublishers, (35<sup>th</sup> Edition), 2010.
- 2. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, keying Ye, Probability and statisticsforengineersand scientists, (9<sup>th</sup>Edition),Pearson Publications.

### **REFERENCEBOOKS:**

- 1. Fundamentalsof MathematicalStatistics,KhannaPublications,S.C.GupthaandV.K.Kapoor.
- 2. MillerandFreund's, ProbabilityandStatisticsforEngineers, (8<sup>th</sup> Edition), PearsonEducations.
- **3.** N.P.BaliandManishGoyal,AtextbookofEngineeringMathematics, (10<sup>th</sup> Edition),LaxmiPublications,Reprint,2010.
- J.W.BrownandR.V.Churchill,ComplexVariablesandApplications, (7<sup>th</sup>Edition),Mc-GrawHill,2004.

Courseoutcomes: Afterlearningthecontentsofthispaper thestudentmustbeableto

- 1. Apply the concepts of Probability and Random Variables to case studies.
- 2. Formulate and solve problems involving Random Variables and apply statistical methods for analyzing experimental data.
- 3. Applyconceptsofestimationandtestingofhypothesistocasestudies.
- 4. Analyzethecomplexfunctionwithreferencetotheiranalyticity,integrationusingCauchy'sintegr aland residue theorems.
- 5. Taylor's and Laurent's series expansions of complex function.

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

### (A403302) MANUFACTURING PROCESSES

### B.Tech (ME): II Year II Sem

L	Т	Р	С
2	0	0	2

### Pre-requisites: None

### 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; Properties of moulding methods. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design. Casting processes – Types – Sand moulding, Centrifugal casting, die casting, Investment casting, shell moulding

### UNIT – II:

**Welding:** Classification – Types of welds and welded joints and their characteristics, Welding Positions - Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, Shielded metal arc welding, submerged arc welding, Resistance welding, Thermit welding.

### UNIT – III:

Inert Gas Welding \_ TIG Welding, MIG welding, Friction welding, Friction Stir 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. Sheet metal Operations: Stamping, Blanking and piercing, Coining, Strip layout, Hot and cold spinning – Bending and deep drawing. Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements. Drawing and its types – wire drawing and Tube drawing – 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, Hydrostatic extrusion. Forces in extrusion Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

High Energy Rate Forming Processes: Principles of Explosive Forming, Electro-hydraulic Forming, Electro-magnetic forming and rubber pad Forming.

### **TEXT BOOKS:**

- 1. Manufacturing Technology / P.N. Rao/ Vol.1 / Mc Graw Hill Education/ 5th Edition, 2018.
- 2. Manufacturing Engineering & Technology / Serope Kalpakjian / Steven R. Schmid / Pearson, 7th Edition,2014

### **REFERENCE BOOKS:**

- 1. Production Technology Vol.: 1, WILEY, sreeramulu M, 2018
- 2. A Text book of Production Technology (Manufacturing Processes) / Dr.P.C. Sharma / S.Chand Publications /1st Edition, 2006.
- 3. Manufacturing processes H. S. Shan, Second Edition, Cambridge University Press, 2017.
- 4. Production Technology: Manufacturing Processes, Technology and Automation / R. K. Jain/Vol.1/Khanna Publishers /19th Edition, 2009.
- 5. Elements of Workshop Technology/ S.K. Hajra Choudhury, A.K. Hajra Choudhury, NirjharRoy/Vol.1/ Media Publishers & Promoters Pvt. Ltd./1st Edition,2008.

Course Outcomes: Student will be able to:

- 1. Elaborate the fundamentals of various molding, casting techniques and furnaces.
- 2. Identify the importance of permanent joining and principle behind different welding processes.
- 3. Explain the concepts of solid-state welding processes
- 4. Understand the concepts of rolling and sheet metal operations in metal working.
- 5. Elaborate the uniqueness of extrusion, forging and high energy rate forming processes in metal working.

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

### (A403309) INSTRUMENTATION & CONTROL SYSTEMS

### B.Tech (ME): II Year II Sem

L	Т	Р	С
3	0	0	3

#### UNIT – I:

Definition – Basic principles of measurement – Measurement systems, generalized configuration and functional description of measuring instruments – examples. Static and Dynamic performance characteristics– sources of errors, Classification and elimination of errors. Measurement of Displacement: Theory and construction of various transducers to measure displacement – Using Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers; Calibration procedures.

### UNIT – II:

Measurement of Temperature: Various Principles of measurement-Classification: Expansion Type: Bimetallic Strip- Liquid in glass Thermometer; Electrical Resistance Type: Thermistor, Thermocouple, RTD; Radiation Pyrometry: Optical Pyrometer; Changes in Chemical Phase: Fusible Indicators and Liquid crystals. Measurement of Pressure: Different principles used- Classification: Manometers, Dead weight pressure gauge Tester (Piston gauge), Bourdon pressure gauges, Bulk modulus pressure gauges, Bellows, Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges, ionization pressure gauges, McLeod pressure gauge.

### UNIT – III:

Measurement of Level: Direct methods – Indirect methods – Capacitive, Radioactive, Ultrasonic, Magnetic, Cryogenic Fuel level indicators –Bubbler level indicators.

Flow measurement: Rotameter, magnetic, Ultrasonic, Turbine flowmeter, Hot – wire anemometer, Laser Doppler Anemometer (LDA).

Measurement of Speed: Mechanical Tachometers, Electrical tachometers, Non-contact type Stroboscope; Measurement of Acceleration and Vibration: Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle- Piezo electric accelerometer.

### UNIT – IV:

Stress-Strain measurements: Various types of stress and strain measurements –Selection and installation of metallic strain gauges; electrical strain gauge – gauge factor – method of usage of resistance strain gauge for bending, compressive and tensile strains – Temperature compensation techniques, Use of strain gauges for measuring torque, Strain gauge Rosettes.

Measurement of Humidity: Moisture content of gases, Sling Psychrometer, Absorption Psychrometer, Dew point meter. Measurement of Force, Torque and Power- Elastic force meters, load cells, Torsion 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-Transfer functions- First and Second order mechanical systems

### **TEXT BOOKS:**

1. Principles of Industrial Instrumentation & Control Systems/Chennakesava R alaavala, Cengage Learning/1st Edition, 2009.

2. Basic Principles - Measurements (Instrumentation) & Control Systems /S. Bhaskar/ Anuradha Publications

### **REFERENCE BOOKS:**

- 1. Measurement Systems: Applications & design, E. O. Doebelin, TMH, Tata Mcgraw Hill/6<sup>th</sup> Edition, 2017.
- 2. Instrumentation, Measurement & Analysis, B.C. Nakra & K.K. Choudhary, TMH, 4th Edition, 2016.
- 3. Experimental Methods for Engineers / Holman
- 4. Mechanical and Industrial Measurements / R. K. Jain/ Khanna Publishers.
- 5. Mechanical Measurements / Sirohi and Radhakrishna / New Age International, 3rd Edition, 2013.

# Course Outcomes:

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

- 1. Know the basic knowledge of the functional blocks of measurement systems.
- 2. Describe the working of various physical variable Temperature and pressure measuring instruments.
- 3. Explain the working of various physical variable Level, flow, Speed and Acceleration measuring instruments.
- 4. Understand the working of various physical and Electrical variables Stress, Humidity, Force, Torque and Power measuring instruments.
- 5. Understand the concept of control system and calculate transfer functions of mechanical and translational systems with different techniques.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01												
CO2												
CO3												
CO4												
CO5												

# (A403507) MANUFACTURING PROCESSES LAB

# B.Tech (ME): II Year II Sem

L	Т	Р	С
0	0	2	1

Pre-requisites: Production Technology

### Minimum of 12 Exercises need to be performed

### I. Metal Casting Lab:

- 1. Pattern Design and making .
- 2. Sand properties testing
- 3. Moulding Melting and Casting 1 Exercise

### II. Welding Lab:

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

### **III. Mechanical Press Working:**

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

### **IV. Processing of Plastics**

- 1. Injection Moulding
- 2. Blow Moulding

# **REFERENCE BOOK:**

1. Dictionary of Mechanical Engineering - G.H.F. Nayler, Jaico Publishing House

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

- 1. Analyze the given problem and conducts investigation on the experimental setup.
- 2. Operate different types of welding machines
- 3. Perform operations on mechanical press.
- 4. Get familiarity with processing of Plastics.
- 5. Effectively communicate and explain the experimental analysis.

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

### (A403509) INSTRUMENTATION AND CONTROL SYSTEMS LABORATORY

#### B.Tech. II Year II Sem.

L	Т	Р	С
0	0	2	1

Pre-requisites: Basic principles of Instrumentation and control systems

#### 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.

#### **Course Outcomes:**

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

- 1. Characterize and calibrate measuring devices.
- 2. Identify and analyze errors in measurement.
- 3. Analyze measured data using regression analysis.
- 4. Calibration of Pressure Gauges, temperature, LVDT, capacitive transducer, rotameter.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C01												
CO2												
CO3												
CO4												
CO5												

### (A403508) COMPUTER AIDED MACHINE DRAWING

#### B.Tech. II Year II Sem.

L	Т	Р	С
0	0	2	1

**Pre-requisites:** Engineering graphics

#### Drawing of Machine Elements and simple parts:

- 1. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
- 2. Keys, cottered joints and knuckle joint.
- 3. Rivetted joints
- 4. Shaft coupling, spigot and socket pipe joint.
- 5. Journal, pivot and collar and foot step bearings.

Drawing of Machine Elements: Using Computer aided drafting in addition to manual drawing

#### **Assembly Drawings:**

Drawing of assembled views for the part drawings of the following using conventions and easy drawing proportions.

- 1. Steam engine parts stuffing box, cross head, Eccentric.
- 2. Machine tool parts: Tail stock, Tool Post, Machine Vices.
- 3. Other machine parts Screw jack, Connecting rod, Plumber block, Fuel Injector
- 4. Valves Steam stop valve, spring loaded safety valve, feed check valve and air cock.

### Assembly Drawings: Using Computer aided drafting in addition to manual drawing

**NOTE:** 1. First angle projection to be adopted.

2. All the drawing components/Assembly to be drawn using any Computer aided drafting package

### **TEXT BOOKS:**

- 1. Machine Drawing / N.D. Bhatt / Charotar
- 2. Machine Drawing with Auto CAD / Goutham Pohit, Goutam Ghosh / Pearson

### **REFERENCE BOOKS:**

- 1. Machine Drawing by / Bhattacharyya / Oxford
- 2. Machine Drawing / Ajeet Singh / Mc Graw Hill

### **Course Outcomes**:

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

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

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### (A403506)MATERIAL SCIENCE & MECHANICS OF SOLIDS LABORATORY

### B. Tech. (ME) II Year II Semester

### MATERIAL SCIENCE LABORATORY

#### List of Experiments:

- 1. Preparation and study of crystal models for simple cubic, body centred cubic, face centred cubic and hexagonal close packed structures.
- 2. Preparation and study of the Microstructure of pure metals like Iron, Cu and Al.
- 3. Preparation and study of the Microstructure of Mild steels, low carbon steels, high Carbon steels.
- 4. Study of the Microstructures of Various Cast Irons.
- 5. Study of the Microstructures of Non-Ferrous alloys. (Al, Cu, Mg)
- Hardenability of steels by Jominy End Quench Test. 6.

#### Course Outcomes: At the end of the lab, the student will be able to

- 1. Design different crystal structures and their models.
- 2. Infer the microstructures developed for different ferrous and non-ferrous metals.
- Correlate the microstructures, properties, performance and processing of alloys. 3.

### MECHANICS OF SOLIDS LAB

#### List of Experiments:

- 1. Direct tension test
- 2. Bending test on Simple supported beam
- Bending test on Cantilever beam 3.
- Torsion test 4.
- 5. Brinell hardness test/ Rockwell hardness test
- Test on springs 6.
- Izod Impact test/ Charpy Impact test 7.

Course Outcomes:

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

- 1. Analyze the behavior of the solid bodies subjected to various types of loading.
- 2. Apply knowledge of materials and structural elements to the analysis of simple structures.
- 3. Undertake problem identification, formulation and solution using a range of analytical methods
- 4. Analyze and interpret laboratory data relating to behavior of structures and the materials they are made of, and undertake associated laboratory work individually and in teams.
- 5. Expectation and capacity to undertake lifelong learning.

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

### (A400701) ENVIRONMENTAL SCIENCES (Common to All Branches)

### B.Tech. II Year II Sem.

L	Т	Р	С
2	0	0	0

#### UNIT-I

Environmental Studies:Introduction, Definition, scope and importance, Ecosystems: Introduction, types, characteristic features, structure and functions of ecosystems, Bio-geo chemical cycle, Classification ofEco system.

#### UNIT-II

Natural Resources: Classification of Resources, Land resources, Land as resource, Common property resources, Land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer –pesticide problems, Forest resources, Use and over-exploitation.

Mining and dams – their effects on forest and tribal people, Water resources, Use and over- utilization of surface and groundwater, Floods, droughts, Water logging and salinity, Dams –benefits and costs, Conflicts over Water, Energy resources.

#### UNIT-III

Bio-diversity and its conservation, Value of bio-diversity-consumptive and productive use, social, ethical, aesthetic and option values, Bio-geographical classification of India – India as a mega diversity habitat, Threats to bio-diversity –Hot-spots, habitat loss, poaching of wild life, loss of species, seeds, etc. Conservation of bio-diversity– In-situ and Ex-situ conservation.

#### UNIT-IV

Environmental Pollution–Local and Global Issues,Nature of thermal pollution and nuclear hazards, Global warming, Acid rain,Ozone depletion, Environmental case studies.

#### UNIT-V

Environmental Problems in India,Drinking water, sanitation and public health,Effects of the activities on the quality of environment, Water scarcity and groundwater depletion,Controversies on major dams – resettlement and rehabilitation of people: problems and concerns,Rain water harvesting, cloud seeding and watershed management. Economy and Environment, The economy and environment interaction,Economics of development, preservation and conservation, Sustainability: theory and practices,Limits to growth,Equitableuse of resources for sustainable life styles, Environmental Impact Assessment.

#### **Text Books**

1. Environmental Science (1<sup>st</sup> edition), Y.Anjaneyulu, B S Publications.

2. Environmental studies (1<sup>st</sup> edition), Deekshadave, Cengage learning India Pvt. Ltd.

#### **Reference books**

- 1. Environmental sciences and Engineering (1st edition), P. VenugopalRao, PHI learning Pvt. Ltd.,
- 2. Environmental Science and Technology (1<sup>st</sup> edition), M. Anji Reddy, B S Publications.
- 3. Clark, R.S., Marine Pollution, Clanderson Press, Oxford, 2002.
- 4. Environmental Encyclopedia (Cunningham, W.P., et al., Jaico Publishing House, Mumbai, 2003.

#### **Course Outcomes:**

On successful completion of this course, it is expected that students should be able to

- 1. Acquire the knowledge on environmental science
- 2. Acquire the knowledge of various natural resources
- 3. Understand the importance of conservation and preserve the biodiversity
- 4. Understand the hazardous effects of environmental pollution

5.	Develor	skills in	understa	nding	various	environi	nental	prob	lems
<b>.</b>	Develop	) SKIIIS III	understu	numg	unious	ch v h ohh	nontui	proor	Unit

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

# (A403801) REAL TIME RESEARCH PROJECT/FIELD BASED PROJECT (Common to All Branches)

L	Т	Р	С
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