JBIET-R24

Academic Regulations & Detailed Syllabus

B.TECH

MECHANICAL ENGINEERING

ACADEMIC REGULATIONS
COURSE STRUCTURE & DETAILED SYLLABUS – R24

MECHANICAL ENGINEERING

B.TECH DEGREE PROGRAMME
(For the Batches admitted from the Academic Year 2024- 25)

B.TECH (LATERAL ENTRY SCHEME)

(For the Batches admitted from the Academic Year 2025-26)

J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC AUTONOMOUS)
Bhaskar Nagar, Yenkapally (V), Moinabad (M), Hyderabad – 500075, Telangana, India

JBIET Academic Regulations –R24

Applicable to

B.Tech Regular Four Year Degree Programme

(For the Batches admitted from the Academic Year 2024- 25)

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B.Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2025-26)

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B.Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2025- 26)

Offered under **Choice Based Credit System (CBCS)**

J**.** B**.** Institute of Engineering and Technology (hereinafter referred to as JBIET) academic regulations JB-R24 are given here under. These regulations approved by the Academic Council shall be in force and applicable from the academic year 2024-25 onwards.

1.0 Under-Graduate Degree Programme in Engineering & Technology

J. B. Institute of Engineering and Technology (JBIET) offers a 4-Year (8 Semesters) Bachelor of Technology (B. Tech) Degree Programme for regular students under Choice Based Credit System (CBCS) in the following branches of Engineering with effect from the academic year 2024-25.

S. No.	Branch Code	Branch Name
1	**01**	Civil Engineering (CE)
2	**02**	Electrical and Electronics Engineering (EEE)
3	**03**	Mechanical Engineering (ME)
4	**04**	Electronics and Communication Engineering (ECE)
5	**05**	Computer Science and Engineering (CSE)
6	**12**	Information Technology (IT)
7	**19**	Electronics and Computer Engineering (ECM)
8	**66**	Computer Science and Engineering (Artificial Intelligence and Machine Learning)-CSE(AI&ML)
9	**67**	Computer Science and Engineering (Data Science)-CSE(DS)
10	**72**	Artificial Intelligence and Data Science (AI&DS)
11	**73**	Artificial Intelligence and Machine Learning (AI&ML)

2.0 Eligibility for Admission

2.1. Admission to the undergraduate (UG) programme shall be made either on the basis of the merit rank obtained by the qualified student in entrance test conducted by the Telangana State Government (EAPCET) or the University or on the basis of any other order of merit approved by the College, subject to reservations as prescribed by the government from time to time.

2.2. The medium of instruction for the entire Undergraduate Programme in Engineering &Technology is English only.

3.0 B. Tech Programme Structure

3.1 Semester Scheme*:* Each Undergraduate (**UG**) Programme is of 4 Academic Years (8 Semesters) with the Academic Year divided into two Semesters of 22 weeks (≥90 instructional days) each. Each Semester is having "**Continuous Internal Evaluation (CIE)**" and "**Semester End Examination (SEE)**" under Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC. The guidelines issued by JNTUH, AICTE and NEP-2020 are followed while designing curriculum / course structure.

3.2 Choice Based Credit System (CBCS): Choice Based Credit System (CBCS) is introduced in line with UGC guidelines in order to promote:

- Student centred learning
- Students to learn courses of their choice
- Interdisciplinary learning

A student has a choice of registering for courses comprising program core, professional electives, open electives, value added, skill-oriented courses etc. Besides, choice is also offered to students for registering courses to earn Minor in Engineering / Honours degree.

3.3 Minimum Duration: The minimum (normal) duration of the B. Tech. Programme for the student securing admission under Regular mode is Four Academic Years (8 Semesters) and for the student admitted under Lateral Entry Scheme is Three Academic Years (6 Semesters) starting from the commencement of the First Year First Semester.

3.4 Maximum Duration: A student admitted under Regular mode shall complete the B. Tech Programme in a maximum period of Eight Academic Years (16 Semesters) and the student admitted under Lateral Entry Scheme shall complete the B. Tech Programme in a maximum period of Six Academic Years (12 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 for regular students and 120 credits for Lateral Entry students (with CGPA ≥ 5) for the completion of the undergraduate programme and award of the B.Tech. degree.

4.0 Course Classification

The curriculum for B. Tech Programme includes various curricular components like Foundation Courses (BS, HS and ES), Core Courses (PC, PW), Elective Courses (PE & OE), Audit Courses (AC), Mandatory Courses (MC) etc. The details of these courses and typical breakup of credits for each category is mentioned in the tables given below.

4.1 Classification

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BS – BasicSciences	Includes Mathematics, Physics and Chemistrysubjects
2		ES- Engg. Sciences	Includes fundamental engineering subjects
3		HS – Humanities and Social sciences	Includes subjects related to Humanities, Socialsciences and Management
4	Core Courses (CoC)	PC– Professional Core	Includes core subjects related to the parent Discipline/ department/ branch of Engineering.
5		PW- Project Work	B. Tech project or UG project or UG major project or Project Stage I & II
6		Industry Training/ Internship/ Industry Oriented Mini-project/ Mini- Project/ Skill Development Courses	Industrial training/ Summer Internship/ Industry Oriented Mini-project/Mini-project
7	Elective Courses(ElC)	PE – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
8		OE – OpenElectives	Elective subjects which include inter-disciplinary subjects or subjects in an

			area outside the parent discipline/ department/ branch of Engineering.
9	Seminar	Seminar	Seminar/ Colloquium based on core contents related to parent discipline/ department/ branchof Engineering.
10	Minor Courses	-	1 or 2 Credit Courses (subset of HS)
11	Audit courses (AC)	-	Value Added Course / Audit Courses (Non-Credit)
12	Mandatory Courses (MC)	-	Mandatory Courses (Non-credit)

4.2 Typical Breakup of Credits for each Category:

S.No	Category	Breakup of Credits
1	Humanities and Social Sciences (HS)- including Management.	**10**
2	Basic Sciences (BS)- Courses including Mathematics, Physics and Chemistry.	**22**
3	Engineering Sciences (ES)-Courses including Workshop, Drawing, Basics of Electrical / Electronics /Mechanical / Computer Engineering.	**22**
4	Professional Core (PC)-Courses relevant to the chosen specialization / branch.	**59**
5	Professional Electives (PE)-Courses relevant to the chosen specialization / branch.	**18**
6	Open Elective (OE) - Courses from other technical and / or emerging subject areas.	**12**
7	Mini-project / Project Work / Internship / Industrial training / Seminar	**17**
8	Mandatory Courses / Audit Courses.	**Non-Credit**
TOTAL		**160**

5.0 Credit System

5.1 The student has to register for all the courses offered in a Semester. The credits assigned for each course are indicated in an L: T: P: C (Lecture periods: Tutorial periods: Practical periods: Credits) pattern as follows:

- Theory Courses: One Lecture Hour (L) per week in a semester: 01 Credit
- Practical Courses: One Practical Hour (P) Per week in a semester: 0.5 Credit
- Tutorial: One Tutorial Hour (T) Per week in a semester: 01 Credit
- Mandatory Courses: No CREDIT is awarded.
- Audit Courses: No CREDIT is awarded.

6.0 Course Registration

6.1. A faculty advisor or mentor shall be assigned to a group of 20 students, who can advise the students about the Programme, it's course structure and curriculum, choice/option for subjects/ courses, based on their competence, progress, pre-requisites and interest.

6.2 Before the commencement of every semester, all the students shall register for the courses offered in that semester through online registration process

6.3 A student can apply for registration, only after obtaining the 'written approval' from faculty advisor, 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 and the student.

6.4 If any student fails to register courses in a semester, he/she shall undergo the courses as per the course structure decided by the Head of the Department.

6.5 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.

6.6 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.

6.7 If any student submits ambiguous choices or multiple options or erroneous entries during registration for the subject(s) / course(s) under a given / specified course group / category as listed in the course structure, the subject / courses decided by the Head of the Department will be final.

6.8 After registering for a course, a student shall attend the classes, to satisfy the attendance requirements, earn Continuous Internal Evaluation (CIE) Marks and appear in Semester End Examinations (SEE).

6.9 Subject / course options exercised while registration is 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 unforeseen or unexpected reasons, then the student shall be allowed to have alternate choice either for a new subject (subject to offering of such a subject), or for another existing subject (subject to availability of seats). Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within the first week after the commencement of class-work for that semester.

6.10 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.

6.11 Open Electives: The students have to choose requisite number of open electives (as prescribed in the course structure) from the list of open electives. However, the student can opt for an Open Elective subject offered by his/her 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.

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

6.13 Subjects/ courses to be offered (Professional Electives and Open Electives) shall be offered to the students if a minimum of 30 students register for that course.

6.14 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 entry from the student for registration in that semester, and the second focus, if needed, will be on CGPA of the student).

6.15 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.

6.16 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’.

7.0. Academic Requirements

7.1 Attendance Requirements

7.1.1 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 Audit Courses) for that semester. Two periods of attendance for each theory subject shall be considered if the student appears for the mid-term examination of that subject.

7.1.2 Shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each semester may be condoned by the College Academic Committee (CAC) on genuine and valid grounds, based on the student’s representation with supporting evidence.

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

7.1.4 A stipulated condonation fee as decided by the CAC is payable for condoning shortage of attendance.

7.1.5 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**.**

7.1.6 A student detained in a semester due to shortage of attendance may be readmitted in the same semester as and when offered in the forthcoming academic years for fulfilment of academic requirements. **The academic regulations under which a student has been readmitted shall be applicable.**

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

7.2 Course Passing Standards

The following academic requirements have to be satisfied, in addition to the attendance requirements mentioned in Item No. 7.1.

7.2.1 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.

7.2.2 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) Industry Oriented Mini Project (or) Internship (or) 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 Industry Oriented 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 Research Project (or) Field Based Research Project (or) Industry Oriented Mini Project (or) Internship evaluations.

7.2.3 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.

7.2.4 Recounting/Revaluation: Students shall be permitted to apply for Recounting /Revaluation of the Semester End Examination answer scripts within a stipulated period after payment of the prescribed fee. After completion of the process of Recounting /Revaluation, the records are updated with changes if any, and the student shall be issued a revised grade sheet. If there are no changes, the same will be shown in the student examination portal.

7.3 Promotion Rules:

Promotion Rules for Regular/Lateral Entry Students

S. No.	Promotion	Conditions to be fulfilled
1	First year first semester to first year second semester	Regular course of study of first year first semester.
2	First year second semester to second year first semester	**Regular Students:** Regular course of study of first year second semester and 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	**Regular Students:** Regular course of study of second year second semester and 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.
		Lateral Entry Students: Regular course of study of second year second semester and 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 takesthose 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	**Regular Students:** Regular course of study of third year second semester and 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.
		Lateral Entry Students: Regular course of study of third year second semester and 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.
7	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester.

7.4 Credit Requirements

The following credit requirements must be satisfied, in addition to the attendance requirements mentioned in item No. 7.1.

7.4.1 A student should earn credits allotted for each of the course by securing minimum marks designated as passing standard for that course.

7.4.2 A student shall be admitted under regular scheme, register for all 160 credits offered and has to earn all the credits (A student admitted under Lateral entry scheme shall register for all 122 credits offered and all the credits). However, the student shall be eligible to avail the benefits that the JNTUH University announces such as exemption of subjects and grace marks for batches admitted during the academic years same as these students.

7.4.3 A student shall register for all mandatory courses mentioned in the curriculum and get minimum pass marks (i.e., 40% of total marks) to get the degree. Grade points obtained in these courses will not be considered for awarding class.

7.4.4 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 all theory and Laboratory courses shall be evaluated for 100 marks each, with **40 marks** allotted for **Continuous Internal Evaluation (CIE)** and **60 marks** for **Semester End-Examination (SEE).**
The details of course-wise allotment of marks are given below.

S. No.	Course	Marks	
		CIE	SEE
1	Theory courses	40	**60**
2	Laboratory courses	40	**60**
3	Mandatory courses	100	--
4	Audit Courses	--	--
5	Internship- I	50	--
6	Internship- II	50	--
7	Mini Project	50	--
8	Project Stage - I	100	--
9	Seminar	50	--
10	**Project Stage - II**	**40**	**60**

8.2 Continuous Internal Evaluation (CIE)

8.2.1 Theory Courses: For theory courses, during the semester there shall be 2 **mid-term examinations** (**internal exams of 30 marks each**), **2 assignments carrying 5 marks each and Subject Viva-Voce/PPT/Poster Presentation/ Case Study on a topic in the concerned subject for 5 marks.**

S. No	Component	Frequency of Evaluation	Marks for Each test	Final Marks (Average)
1	**Mid Examinations**	2	30	30
2	**Assignments**	2	5	5
4	**Viva-Voce/PPT/Poster Presentation/ Case Study**	1		5
			Total	40

Mid-term Examinations (30 marks): 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:

Mid Term Examination for 30 marks:

a. Part - A : Objective/quiz paper for 10 marks.
b. Part - B : Descriptive paper for 20 marks.

The objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 10 marks. The descriptive paper shall contain 6 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 Mid-I shall be conducted after first spell of instructions covering the syllabus of Modules I and II. The Mid-II shall be conducted after second spell of instructions covering the syllabus of Modules III, IV and V.

Assignments (5 marks): There shall be two assignments for 5 marks each. Assignment-1 shall be submitted before I-mid examinations covering the topics from Module-1 and Module-2, and the Assignment-2 shall be submitted before II-mid examinations covering the topics from Module-3, Module-4 and Module-5. The assignments are used to test the student in Bloom's higher order thinking skills. The average of the two assignments shall be taken as the final marks for assignment (for 5 marks).

Viva-Voce/ PPT /Poster Presentation/ Case Study (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.

8.2.2 If a student is absent for any mid-term Examination on medical grounds / due to any emergency / unavoidable circumstances, the student may be permitted to apply for makeup examinations within a week after completion of Mid-Term Examinations. A sub-committee with the following composition will look into such cases. Student shall pay Rs.200 per subject as registration fee in which he/she is appearing for re-examination.

S. No	Faculty Member	Designation
1	Concerned Head of the Department	Chairman
2	Faculty nominated by Principal	Member
3	Senior faculty member of the concerned Department	Member
4	Class Teacher of the class/section	Member

8.2.3 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 overall, 40% of marks (i.e. 40 marks out of 100 marks) both CIE and SEE marks put together.

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

8.2.5 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.

8.3 Semester End Examinations (SEE)

8.3.1 Theory Courses

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.

8.3.2 Laboratory Courses

Continuous Internal Evaluation (CIE): The continuous internal evaluation for laboratory courses during the semester is evaluated for 40 marks and 60 marks for Semester End Examination. Out of the 40 marks for internal evaluation:

i. 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

ii. 10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.

iii. The remaining 10 marks are for Laboratory Report/Project and Presentation, 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.

iv. Internal laboratory examination (ILE) for 10 marks shall be conducted by the faculty member handling the laboratory. ILE shall be conducted after Second spell of instructions.

S.No	Component	Marks
1	Day-to-Day Evaluation	30
2	Internal Examination	10
	Total	40

8.3.3 Semester End Examination for Laboratory Courses The performance of the student in laboratory courses shall be evaluated for **60 marks** jointly by Internal and External Examiners for 3 hours duration. The total 60 marks are divided and allocated as shown below:

- 10 marks for write-up
- 15 for experiment/program
- 15 for evaluation of results

- 10 marks for presentation on another experiment/program in the same laboratory course and
- 10 marks for viva-voce on concerned laboratory course.

8.3.4 Evaluation of Elements of CE/ME/EEE/ECE/CSE etc 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) is absent as per schedule, or (ii) secures less than 40% marks in this course.

CSE/IT and Allied branches: The Continuous Internal Evaluation (CIE) will be for 50 marks. Each Mid-Term examination consists of two parts i) Part – A for 20 marks, ii) Part – B for 20 marks with a total duration of 2 hours.

Part A: Objective/quiz paper is set with multiple choice, fill-in the blanks and match the following type of questions for a total of 20 marks. Part B: Descriptive paper shall contain 6 full questions out of which, the student has to answer 4 questions, each carrying 5 marks.

The remaining 10 marks of Continuous Internal Evaluation are for Assignment (5 marks) and Subject Viva-Voce/PPT/Poster Presentation/ Case Study (5 marks) and the evaluation pattern will remain same as for other theory subjects.

CE/ME/EEE/ECE branches: the Continuous Internal Evaluation (CIE) will be for 50 marks. Out of the 50 marks for internal evaluation:

a) 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

b) 10 marks for viva-voce (or) tutorial (or) case study (or) application (or) poster presentation of the course concerned.

c) Internal practical examination conducted by the laboratory teacher concerned shall be evaluated for 15 marks.

d) The remaining 15 marks are for Laboratory Report/Project and Presentation, which consists of the Design (or) Software / Hardware Model Presentation (or) App Development (or) Prototype Presentation submission which shall be evaluated after completion of laboratory course and before semester end practical examination.

8.4 Internship: Students should undergo two Internships. Internship-I shall be carried out under the guidance of professors from Science and Basic Engineering Subjects, with topics having some social relevance. The Internship-I is to be taken up during the summer vacation after I Year II Semester Examination and it will be evaluated in II Year I semester for 50 marks. However, the process might be initiated before the end of I Year II Semester by the concerned department. The students admitted under Lateral Entry Scheme (LES) shall carry out internship in the area of their Diploma specialization under the guidance of a faculty member of that department immediately in the first month, after their joining of the course.

The Internship-II is to be taken up during the summer vacation after II Year II Semester examination and it will be evaluated in III Year I semester for 50 marks. However, the

process might be initiated before the end of II Year II Semester by the concerned department.

For both the Internships, the student shall submit a report on the training undergone. The internships shall be evaluated by a three-member committee constituted by the Head of Department to assess the student performance on the following parameters. There shall be no Semester End Examinations for the Internships.

Parameter	Marks
Internship report	15
Quality of work	15
Presentation	15
Viva-Voce	5
Total	50

8.5 Industry Oriented Mini Project: A student is required to undergo a Mini Project of his/her choice during the vacation after III Year II Semester Examination by applying theoretical concepts to develop a practical component /element/system that includes design/ testing/ analysis. The performance of a student in the Mini Project shall be evaluated in IV Year I Semester by a three-member committee constituted by the HoD as per the following parameters:

Parameter	Marks
Mini Project report	15
Quality of work	15
Presentation	15
Viva-Voce	5
Total	50

The performance of a student in Mini Project shall be evaluated based on two reviews, each carrying 50 marks. The average marks of these two reviews will be awarded. **There shall be no Semester End Examination** for the Industry Oriented Mini Project.

8.6 Seminar: There is a seminar in IV Year II Semester for 50 Marks. The student shall deliver a seminar on any emerging topic of his / her choice from the core technical domain. The student shall submit a duly-certified seminar report. A three-member committee constituted by the HoD will evaluate the seminar report submitted by the student. **There shall be no Semester End Examination**.

If a student is absent for seminar on medical grounds / due to any emergency / unavoidable circumstances, the student may be permitted to reappear within a month.

8.7 Project Work: The student is required to undertake a Project Work by using the knowledge acquired by him / her during the course of study. The student is expected to

design and build a complete system or subsystem on his / her area of interest. The Project Work consists of two parts namely, Project Stage -I (Project Survey) and Project Stage – II (Project Implementation). Project Stage – I is carried out during IV Year I Semester and the Project Stage – II during IV Year II Semester. A project work shall be taken up by a batch of students not exceeding 4 members under the guidance of a faculty supervisor.

For Project Stage – I, the Project Review Committee (PRC) consisting of the Head of the Department, Project Coordinator, Project supervisor and one senior faculty member shall evaluate the Project Work for 50 marks before II Mid Examination of IV-I Semester. **There shall be no End Semester Evaluation for Project Phase-I**. The student is deemed to have failed, if he

(i) 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
(ii) Secures less than 40% marks in the CIE.

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

For Project Stage – II, Project Review Committee (PRC) consisting of the Head of the Department, Project supervisor, Project Coordinator and a senior faculty member **shall evaluate for 40 marks as continuous evaluation**. The External Examiner shall **evaluate the Project work for 60 marks as Semester End Examination**. 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 student is deemed to have failed, if he (i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the External Examiner as per schedule, or (ii) Secures less than 40% marks in the sum total of the CIE and SEE taken together. The student is deemed to have failed, if he

(i) does not submit a report on Project Stage - II, or does not make a presentation of the same before the external examiner as per schedule.
(ii) Secures less than 40% marks in the sum total of the CIE and SEE taken together.

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/she must reappear for the same in the next subsequent semester, as and when it is scheduled.

For conducting Viva-Voce of Project Stage – II, the principal selects the External Examiner from the list of experts in the relevant branch of engineering submitted by the concerned Head of the Department.

8.8 A student shall be given only one time chance to re-register for a maximum of two subjects in a semester:

If the internal marks secured by a student in the Continuous Internal Evaluation marks for 40 (Sum of average of two mid-term examinations consisting of Objective & descriptive parts, Average of two Assignments & Subject Viva-voce/ PPT/ Poster

presentation/ Case Study on a topic in the concerned subject) are less than 35% and failed in those subjects. A student must re-register for the failed subject(s) for 40 marks within four weeks of commencement of the classwork in next academic year.

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

8.8 Mandatory Courses (MC)

Mandatory courses carry "ZERO" credit. There shall be NO Semester-end examination. However, attendance in Mandatory Curses shall be considered while calculating aggregate attendance in a semester. The Continuous Internal Evaluation (CIE) shall be conducted and evaluated for 40 marks similar to the theory courses. In addition to this an internal Examination for 60 marks covering the syllabus from all five modules is conducted. The student shall be declared to have passed the mandatory courses only when he/she secures 40% marks in the internal evaluation carried out for 100 marks. If the student fails, a re-examination shall be conducted for such candidates in the following semester before the supplementary examinations. The performance of the student shall be indicated in the grade sheets "PASS" (or) "FAIL" only. The student should pass all the mandatory courses, for the award of B.Tech degree.

8.9 Audit Courses (AC)

Audit courses carry **zero** credits. There shall be No mid-term and Semester End Examination. However, attendance in audit courses shall be considered while calculating aggregate attendance in a semester. The student should study all the audit courses. No credits will be assigned to these courses. A separate certificate will be issued by the Head of the institution on satisfactory completion of Audit Courses.

The student may be permitted to register Mandatory courses and Audit courses as MOOCs offered by SWAYAM / NPTEL / EdX / Coursera / Udacity / Udemy /upgrad/ Khan Academy / Edureka / QEEE etc. The student shall submit weekly assessment report to the faculty coordinator as mentioned in 9.1 and the same shall be considered for internal marks and attendance.

9.0 Massive Open Online Courses (MOOCs)

A student shall be permitted to register BOS approved list of online / self-study course in lieu of the Professional Electives; Open Electives from Massive Open Online Courses (MOOCs) offered by SWAYAM / NPTEL / EdX / Coursera / Udacity / Udemy /upgrad/ Khan Academy / Edureka / QEEE etc. However, the syllabus of the MOOC course shall be approved by the concerned BOS. No formal lectures will be delivered for a self-study course.

9.1 One faculty member for each course shall be nominated as coordinator by the Department to monitor the progress made by the student. The coordinator needs to carry out the conversion of grades awarded to the student in internal and external examinations by the MOOCs offering institution into corresponding grades of JBIET. If any student fails

to successfully complete the MOOC course in the first attempt, he/she shall complete it in the supplementary examination conducted by the college in the subsequent semesters. The question paper pattern and evaluation process for the examination of such subjects for MOOC courses will be similar to that of any other theory course offered under R24.

10.0. Grading Procedure

10.1 Grades will be awarded to indicate the performance of students in each Theory subject, Laboratory / Practical, Seminar, Industry Oriented Mini Project, and Project Stage - I & II. 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 is given.

10.2 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 is 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+ (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B+ (Good)	7
50 and less than 60%	B (Average)	6
40 and less than 50%	C (Pass)	5
Below 40%	F (FAIL)	0
Absent	Ab	0

Credit Points (CP) = Grade Point (GP) x Credits …. for a course

A student passes the subject/ course only when GP ≥ 5 ('C' grade or above).

10.3 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of Credit Points (Σ CP) 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 given below:

$$SGPA = \frac{\sum_{i=1}^{N} C_i G_i}{\sum_{i=1}^{N} Ci} \text{ for each Semester}$$

where ‘i’ is the subject indicator index (takes into account 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^{th} subject, and G_i represents the grade points (GP) corresponding to the letter grade awarded for that i^{th} subject.

10.4 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 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.

$$CGPA = \frac{\sum_{j=1}^{M} C_j G_j}{\sum_{j=1}^{M} C_j} \quad \text{for all S number of semesters registered}$$

(i.e., up to and inclusive of S semesters, S ≥ 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 1st semester onwards up to and inclusive of the 8th 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^{th} subject, and G_j represents the grade points (GP) corresponding to the letter grade awarded for that j^{th} subject. After registration and completion of I Year I Semester, the SGPA of that semester itself may be taken as the CGPA, as there are no cumulative effects.

Illustration of calculation of SGPA:

Course/Subject	Credits	Letter Grade	Grade Points	Credit Points
Course 1	4	A	8	4 x 8 = 32
Course 2	4	O	10	4 x 10 = 40
Course 3	4	C	5	4 x 5 = 20
Course 4	3	B	6	3 x 6 = 18
Course 5	3	A+	9	3 x 9 = 27
Course 6	3	C	5	3 x 5 = 15
	21			152

$$SGPA = \frac{152}{21} = 7.24$$

Illustration of calculation of CGPA up to 3rd semester:

Semester	Course/ Subject Title	Credits Allotted	Letter Grade Secured	Corresponding Grade Point (GP)	Credit Points(CP)
I	Course 1	3	A	8	24
I	Course 2	3	O	10	30
I	Course 3	3	B	6	18
I	Course 4	4	A	8	32
I	Course 5	3	A+	9	27
I	Course 6	4	C	5	20
II	Course 7	4	B	6	24
II	Course 8	4	A	8	32
II	Course 9	3	C	5	15
II	Course 10	3	O	10	30
II	Course 11	3	B+	7	21
II	Course 12	4	B	6	24
II	Course 13	4	A	8	32
II	Course 14	3	O	10	30
III	Course 15	2	A	8	16
III	Course 16	1	C	5	5
III	Course 17	4	O	10	40
III	Course 18	3	B+	7	21
III	Course 19	4	B	6	24
III	Course 20	4	A	8	32
III	Course 21	3	B+	7	21
	Total Credits	69		Total Credit Points	518

$$CGPA = \frac{518}{69} = 7.51$$

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

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

10.6 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 is mentioned only on the Memorandum of Grades in which sitting the student passed his/her last exam in that semester. However, Mandatory Courses will not be taken into consideration.

11.0 Award of Degree

A student is declared to have 'qualified' for the award of B. Tech. degree by JNTUH, in the chosen branch of Engineering selected at the time of admission, if he/she fulfills the following conditions.

11.1 The student shall pursue a programme of study for not less than four academic years and not more than eight academic years. In case of lateral entry students, student shall pursue a programme of study for not less than three academic years and not more than six academic years.

11.2 The student shall register for 160 credits and has to secure all 160 credits (122 credits in case of lateral entry students). Marks obtained in all 160 credits shall be considered for the award of the class based on aggregate of grades. Also, the student should appear and complete all mandatory courses prescribed.

11.3 However, the students are eligible to avail the benefits such as exemption of credits that degree awarding University (JNTUH) announces to the students admitted during this period

12.0 Award of Class

12.1 A student who qualifies for the award of the degree as is placed in the following classes. 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

(i) Should have passed all the subjects/courses in 'First Appearance' within the first 4 academic years (or 8 sequential semesters) from the date of commencement of 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**.

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

12.3 Students with final CGPA (at the end of the undergraduate programme) ≥7.0 but < 8.00 shall be placed in 'First Class'.

12.4 Students with final CGPA (at the end of the undergraduate programme) ≥ 6.00 but < 7.00, shall be placed in 'Second Class'.

12.5 All other students who qualify for the award of the degree with final CGPA (at the end of the undergraduate programme) ≥ 5.00 but < 6, shall be placed in 'pass class'.

12.6 A student with final CGPA (at the end of the undergraduate programme) < 5.00 will not be eligible for the award of the degree.

13.0 Award of 2-Year B.Tech. Diploma Certificate

13.1 A student is declared to have 'qualified' for the award of **2-Year B.Tech. Diploma Certificate** by JNTUH, in the chosen branch of Engineering selected at the time of admission if he/she fulfils the following conditions.

1. When a student wants to exit from 4-Year B. Tech. programme, he/she has to fulfil all the academic requirements and earn all the registered 80 credits (within 4 years from the date of admission) up to B. Tech. – II Year – II Semester to be eligible for **2-Year 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.

13.2 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.

13.3 Lateral Entry students are not eligible for 2-Year B. Tech. Diploma Certificate

13.4 Multiple Entry and Multiple Exit: As a part of the National Education Policy (NEP) 2020, the students are allowed to enter and exit their academic programs at various stages with recognized certifications. If a student wishes to exit from 4-Year B. Tech. programme after I Year, then a certificate will be issued by the principal indicating all the subjects studied during I Year provided he/she has to fulfil all the academic requirements and earn all the registered 40 credits within 2 years from the date of admission.

14.0 Break of Study from a Programme (Gap Year)

14.1 A student is permitted to go on break of study for a maximum period of two years either as two breaks of one year each or a single break of two years after completion of II-year II semester.

14.2 In case, a student wishes to extend the gap year for one more consecutive year, he/she shall be permitted with the prior approval of the Principal on the recommendations of the Head of the Department prior to the beginning of the semester in which he/she has taken break of study.

14.3 The student shall apply for break of study in advance, in any case, not later than the last date of the first assessment period in a semester. The gap year concept is introduced for start-up (or) incubation of an idea, National/International Internships, and professional volunteering. Student taking break of study shall submit an application to the Principal through the Head of the department. A committee shall be appointed by the Principal in this regard. Based on the recommendations of the committee, the Principal shall decide whether to permit the student to avail the gap year or not.

14.4 Students permitted to rejoin the programme after break of study shall be governed by the Curriculum and Regulations in force at the time of rejoining. The students rejoining in new regulations shall apply to the Principal in the prescribed format through the Head of the Department, at the beginning of the readmitted semester for registering additional / equivalent courses to comply with the curriculum in-force.

14.5 The period of break of study shall be counted in the maximum period of graduation (i.e the maximum period of graduation is 8 years for Regular admitted students and 6 years for Lateral Entry admitted students availing Gap Year).

14.6 If a student has not reported to the college after completion of the approved period of break of study he is deemed to be detained in that semester. Such students are eligible for readmission into the semester when offered next.

15.0 Transitory Regulations:

The transitory guidelines are applicable to the students

15.1 Who have been detained due to lack of attendance in any semester, shall be permitted the join the corresponding semester.

15.2 Students detained due to shortage of credits, shall be promoted to the next semester only after acquiring the required credits as per the corresponding regulations of his / her admission

15.3 Students who have discontinued and wish to continue the Programme, are eligible for admission into the unfinished semester.

15.4 If a student readmitted to JB-R24 Regulations, has already studied any subject with 80% of syllabus common in his / her previous regulations, that particular subject in JB-R24 Regulations will be substituted by another subject to be suggested by the BOS concerned. If the readmitted student has not studied the pre-requisite subjects for any subject offered in JB-R24 regulations, remedial classes shall be arranged by the concerned HoD.

16. 0 Transfer of Students from other Colleges / Universities

Transfer of students from other Colleges or Universities are permitted subject to the rules and regulations of Telangana State Council for Higher Education (Technical Education Department) and JNTUH in vogue.

17.0 Malpractices Rules

Disciplinary Action For / Improper Conduct in Examinations

	Nature of Malpractices/Improper conduct	Punishment
	If the student:	
1.(a)	Possesses any item accessible in the examination hall like paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which student is appearing but has not made use of (material shall include any marks on the body of the student 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.
(b)	Gives assistance or guidance or receives it from any other student orally or by any nonverbal cues or communicates through cell phones with any student 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 students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year.
3.	Smuggles in the answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student 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 student is also debarred for two consecutive semesters from class work and all End examinations. The continuation of the course by the student is subject to the academic regulations in connection with

		forfeiture of seat.
4.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
5.	Refuses to obey the orders of the chief superintendent/ assistant superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination	In case of students of the college, they is expelled from examination halls and cancellation of their performance in that subject and all other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a Police case is registered against them.
6.	Leaves the exam hall taking away answer script or intentionally tears off 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 student 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 student is also debarred for two consecutive semesters from class work and all End examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
7.	Possesses 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 student 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 student is also debarred and forfeits the seat.
8.	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.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student 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 student 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.
9.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student 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
10.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared including practical examinations and project work of that semester/year examinations.

- *If any malpractice is detected which is not covered in the above clauses 1 to 10 shall be referred to the Malpractice Committee for further action and to impose suitable punishment.*

Academic Regulations for *B. Tech. with Honours programme*

1. Objectives

The key objectives of offering B. Tech. with Honours programme are:

- To expand the domain knowledge of the students laterally and vertically to cope up with Education 4.0.
- To enhance the employability of undergraduate students as per Industry 4.0 standards.
- To provide an opportunity to students to pursue their higher studies in wider range ofspecializations.

2. Academic Regulations for B. Tech. Honours degree

1) The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B. Tech. programme.
2) For B. Tech with Honours programme, a student needs to earn additional 20 credits (over and above the required 160 credits for B. Tech degree). The broad guidelines for the courses of Honours programme, their respective credits weightage and semester-wise break-up of the course are enclosed as Annexure. **All these 20 credits need to be completed in III year I Semester to IV year I Semester only.**
3) After registering for the Honours programme, **if a student is unable to pass all courses in first attempt and earn the required 20 credits, he/she shall not be awarded Honours degree**. However, if the student earns all the required 160 credits of B. Tech., he/she will be awarded only B. Tech degree in the concerned branch.
4) There is no transfer of credits from courses of Honours programme to regular B. Tech. degreecourse & vice versa.
5) These 20 credits are to be earned from the additional courses offered by the host department in the college or from a closely related department in the college as well as from the MOOCS platform.
6) **Guidelines for courses selected under MOOCs platform :**
   a) Prior to registration of MOOCS courses, formal approval of the courses, by the Head of the Department is essential. Head of the Department before the issue of approval considers the parameters like the institute / agency which is offering the course, syllabus, credits, duration of the programme and mode of evaluation etc.
   b) Department wise MOOCs finalized are to be consolidated and needs to be

approved by BOS before commencement of the semester.

c) Minimum credits for a MOOCS course must be equal to or more than the credits specified in the Honours course structure provided by the JBIET.

d) Only Pass-grade/marks or above shall be considered for inclusion of grades in the Honours grade memo.

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

7) The **choice to opt/take the Honours programme is purely on the choice of the students**.

8) The student shall be given a **choice of withdrawing all the courses registered and/or the credits earned for Honours programme at any time**; and in that case the student will be awardedonly B. Tech. degree in the concerned branch on earning the required credits of 160.

9) The students of every branch can choose Honours programme in their respective branches if they are eligible for the Honours program**. A student who chooses an Honours programme is not eligible to choose a Minor programme and vice-versa.**

10) Students can register for the Honours programme only if they fulfill the **eligibility criteria.**

11) A student can graduate with Honours if he/she fulfils the requirements for his/her regular B. Tech. programme as well as fulfils the requirements for Honours programme.

12) The record of students registered and pursuing their Honours programs branch-wise is sent to JNTUH once the enrolment process is complete.

13) The department shall prepare the time-tables for each Honours programme offered at their respective departments without any overlap/clash with other courses of study in therespective semesters.

3. Eligibility conditions of the students for the Honours degree

a) A student can opt for B.Tech. degree with Honours, if she/he passed all subjects in first attempt in all the semesters till the results announced and **maintaining 7.5 or moreCGPA.**

b) **If a student fails in any registered course of either B. Tech. or Honours in any semester of four years programme, he/she will not be eligible for obtaining Honours degree**. He willbe eligible for only B. Tech. degree

c) Prior approval of mentor and Head of the Department for the enrolment into Honours programme, before commencement of III year I Semester (V Semester), is mandatory.

d) If more than 30% of the students in a branch fulfil the eligibility criteria (as stated above), the number of students given eligibility is limited to 30%. The criteria to be followed for choosing 30% candidates in a branch may be the **CGPA secured bythe students till II year I semester.**

e) Successful completion of 20 credits earmarked for honours programme with at least 7.5 CGPA along with successful completion of 160 credits earmarked for

regular B. Tech. Programme with at least 7.5 CGPA and passing all subjects in first attempt gives the eligibility for the award of B. Tech. (Honours) degree.

f) For CGPA calculation of B. Tech. course, the 20 credits of Honours programme will not beconsidered.

4. Registration for the course in Honours programme

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

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

c) The maximum No. of courses for the Honours is limited to two in a semester along with regular semester courses.

d) The students need to register the Honours degree by paying an registration fee of Rs. 1000/- per one credit.

e) A fee for late registration will be imposed as per the norms of JNTUH.

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Academic Regulations for Honours degree in B. Tech. programs

S. No.	Year / Semester	Course to be chosen from/studied	Mode of Learning	No. of Credits
1	III-I	PE-1	Blended/Conventional	4
2	III-I	PE-2	Blended/Conventional	4
3	III-II	PE-3	Blended/Conventional	4
4	III-II	MOOC Platform (PE-4 or an Inter disciplinary subject)	MOOCS	2
5	IV-I	PE-5	Blended/Conventional	4
6	IV-I	MOOC Platform (PE-6 or an Inter disciplinary subject)	MOOCS	2
	Total Credits			**20**

Note:

- The attendance and evaluation scheme for Honours degree courses will be same as the regular B. Tech. courses.
- If the blended course option is chosen, for the subjects in any semester, the learning should be partially in online mode and partially in offline mode. The Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) shall be carried out by JBIET.

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Academic Regulations for *B. Tech. with Minors programme*

1. Objectives

The key objectives of offering B. Tech. with Minor programme are:

- To expand the domain knowledge of the students in one of the other branches ofengineering.
- To increase the employability of undergraduate students keeping in view of betteropportunity in interdisciplinary areas of engineering & technology.
- To provide an opportunity to students to pursue their higher studies in the inter-disciplinaryareas in addition to their own branch of study.
- To offer the knowledge in the areas which are identified as emerging technologies/thrustareas of Engineering.

2. Academic Regulations for B. Tech. Minors degree

- The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B. Tech. programme.
- For B. Tech with Minors programme, a student needs to earn additional 20 credits (over andabove the required 160 credits for B. Tech degree). The broad guidelines for the courses of Minors programme, their respective credits weightage and semester-wise break-up of thecourse are enclosed as Annexure. **All these 20 credits need to be completed in III year I Semester to IV year I Semester only.**
- After registering for the Minors programme, **if a student is unable to pass all courses in first attempt and earn the required 20 credits, he/she shall not be awarded Minors degree**.However, if the student earns all the required 160 credits of B. Tech., he/she will be awarded only B. Tech degree in the concerned branch.
- There is no transfer of credits from courses of Minors programme to regular B. Tech. degreecourse & vice versa.
- These 20 credits are to be earned from the additional courses offered by the host department in the college or from a closely related department in the college as well as from the MOOCS platform.

3. Guidelines for courses selected under MOOCs platform :

a. Prior to registration of MOOCS courses, formal approval of the courses, by the Head of the Department is essential. Head of the Department before the issue of approval considers the parameters like the institute / agency which is offering the course, syllabus, credits, duration of the programme and mode of evaluation etc.

b. Department wise MOOCs finalized are to be consolidated and needs to be approved by BOS before commencement of the semester.
c. Minimum credits for a MOOCS course must be equal to or more than the credits specified in the Minors course structure provided by the JBIET.
d. Only Pass-grade/marks or above shall be considered for inclusion of grades in the Minors grade memo.
e. Any expenses incurred for the MOOCS courses are to be met by the students only.

4. The **choice to opt/take the Minors programme is purely on the choice of the students**.

5. The student shall be given a **choice of withdrawing all the courses registered and/or the credits earned for Minors programme at any time**; and in that case the student will be awarded only B. Tech. degree in the concerned branch on earning the required credits of 160.

6. The students of every branch can choose Minors programme in different branches if they are eligible for the Minors programme**. A student who chooses an Minors programme is not eligible to choose a Honours program and vice-versa.**

7. Students can register for the Minors programme only if they fulfill the **eligibility criteria.**

8. A student can graduate with Minors if he/she fulfils the requirements for his/her regular B. Tech. programme as well as fulfils the requirements for Minors programme.

9. The record of students registered and pursuing their Minors programs branch-wise is sent to JNTUH once the enrolment process is complete.

10. The department shall prepare the time-tables for each Minors programme offered at their respective departments without any overlap/clash with other courses of study in therespective semesters.

11. Eligibility conditions of the students for the Minors degree

g) A student can opt for B.Tech. degree with Minors, if she/he passed all subjects in first attempt in all the semesters till the results announced and **maintaining 7.5 or moreCGPA.**

h) **If a student fails in any registered course of either B. Tech. or Minors in any semester of four years programme, he/she will not be eligible for obtaining Minors degree**. He willbe eligible for only B. Tech. degree

i) Prior approval of mentor and Head of the Department for the enrolment into Minors programme, before commencement of III year I Semester (V Semester), is mandatory.

j) If more than 30% of the students in a branch fulfil the eligibility criteria (as stated above), the number of students given eligibility is limited to 30%. The criteria to be followed for choosing 30% candidates in a branch may be the **CGPA secured bythe students till II year I semester.**

k) Successful completion of 20 credits earmarked for Minors programme with at least 7.5 CGPA along with successful completion of 160 credits earmarked for regular B. Tech. Programme with at least 7.5 CGPA and passing all subjects in first attempt gives the eligibility for the award of B. Tech. (Minors) degree.

l) For CGPA calculation of B. Tech. course, the 20 credits of Minors programme will not beconsidered.

12. Registration for the course in Minors programme

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

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

h) The maximum No. of courses for the Minors is limited to two in a semester along with regular semester courses.

i) The students need to register the Minors degree by paying an registration fee of Rs. 1000/- per one credit.

j) A fee for late registration will be imposed as per the norms of JNTUH.

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Academic Regulations for Minors degree in B. Tech. programs

S. No.	Year / Semester	Course to be chosen from/studied	Mode of Learning	No. of Credits
1	III-I	PE-1	Blended/Conventional	4
2	III-I	PE-2	Blended/Conventional	4
3	III-II	PE-3	Blended/Conventional	4
4	III-II	MOOC Platform (PE-4 or an Inter disciplinary subject)	MOOCS	2
5	IV-I	PE-5	Blended/Conventional	4
6	IV-I	MOOC Platform (PE-6 or an Inter disciplinary subject)	MOOCS	2
	Total Credits			**20**

Note:

- The attendance and evaluation scheme for Minors degree courses will be same as the regular B. Tech. courses.

- If the blended course option is chosen, for the subjects in any semester, the learning should be partially in online mode and partially in offline mode. The Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) shall be carried out by JBIET.

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JBIET- R24	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech - ME
B. Tech. Course Structure		

I Year I Semester									
S. No.	Code	Course Title	L	T	P	C	Category	common subject (Y/N)	Approving BOS
1	M110A	Matrices and Calculus	3	1	0	4	BS	Y	MATHS
2	M110B	Applied Physics	3	1	0	4	BS	Y	PHYSICS
3	M112A	Basic Electrical Engineering	3	0	0	3	ES	Y	EEE
4	M1132	Elements of Mechanical Engineering	2	0	0	1	ES	N	ME
5	M115B	Programming for Problem Solving	3	0	0	3	ES	Y	CSE
6	M1101	Physics Laboratory	0	0	2	1	BS	Y	PHYSICS
7	M1121	Basic Electrical Engineering Lab	0	0	2	1	ES	Y	EEE
8	M1151	Programming for Problem Solving Lab	0	0	2	1	ES	Y	CSE
9	M1131	Engineering Workshop and Digital Fabrication	0	1	3	2.5	ES	Y	ME
10	M11AC1	Linguaskill for Professionals – B1	2	0	0	0	AC	Y	ENGLISH
Total			**16**	**3**	**9**	**20.5**			

I Year II Semester									
S. No.	Code	Course Title	L	T	P	C	Category	common subject (Y/N)	Approving BOS
1	M120A	Differential Equations and Vector	3	1	0	4	BS	Y	MATHS
2	M120D	Engineering Chemistry	3	1	0	4	BS	Y	CHEMISTRY
3	M120C	English for Skill Enhancement	3	0	0	3	HS	Y	ENGLISH
4	M123A	Engineering Mechanics	3	1	0	4	ES	Y	ME
5	M1232	Computer Aided Engineering Graphics	0	1	3	2.5	ES	Y	ME
6	M1203	English Language and Communication Skills Lab	0	0	2	1	HS	Y	ENGLISH
7	M1202	Chemistry Laboratory	0	0	2	1	BS	Y	CHEMISTRY
8	M12AC2	Human Values and Professional Ethics	2	0	0	0	AC	Y	ENGLISH
Total			**14**	**4**	**7**	**19.5**			

B. Tech. Course Structure

II Year I Semester

S. No.	Code	Course Title	L	T	P	C	Category	common subject (Y/N)	Approving BOS
1	M210A	Probability and Statistics	3	1	0	4	BS	Y	MATHS
2	M213A	Metallurgy and Material Science	3	0	0	3	ES	N	ME
3	M213B	Mechanics of Solids	3	1	0	4	PC	N	ME
4	M213C	Production Technology	3	0	0	3	PC	N	ME
5	M213D	Thermodynamics	3	0	0	3	PC	N	ME
6	M2131	Material Science and Mechanics of solids Lab	0	0	2	1	ES	N	ME
7	M2132	Production Technology Lab	0	0	2	1	PC	N	ME
8	M2134	Computer Aided Machine Drawing Lab	0	0	2	1	PC	N	ME
9	M2133	Internship - I	0	0	2	1	PW	N	ME
10	M21MC2	Gender Sensitization	2	0	0	0	MC	Y	ENGLISH
Total			**17**	**2**	**8**	**21**			

II Year II Semester

S. No.	Code	Course Title	L	T	P	C	Category	common subject (Y/N)	Approving BOS
1	M223A	Kinematics of Machinery	3	1	0	4	PC	N	ME
2	M223B	Thermal Engineering	3	0	0	3	PC	N	ME
3	M223C	Fluid Mechanics and Hydraulic Machines	3	0	0	3	PC	N	ME
4	M223D	Instrumentation and Control Systems	3	0	0	3	PC	N	ME
5	M223E	Composite Materials	3	0	0	3	PC	Y	ME
6	M2231	Fluid Mechanics and Hydraulic Machines Lab	0	0	2	1	PC	N	ME
7	M2232	Instrumentation and Control Systems Lab	0	0	2	1	PC	N	ME
8	M2233	Thermal Engineering Lab	0	0	2	1	PC	N	ME
9	M22MC1	Environmental Science	2	0	0	0	MC	Y	CIVIL
Total			**17**	**1**	**6**	**19**			

B. Tech. Course Structure

III Year I Semester

S. No.	Code	Course Title	L	T	P	C	Category	common subject (Y/N)	Approving BOS
1	M31EA	Business Economics and Financial Analysis	3	1	0	4	HS	Y	MBA
2	BTMEE1	Professional Elective – I	3	0	0	3	PE	N	ME
3	BTMEO1	Open Elective – I	3	0	0	3	OE		
4	M313A	Dynamics of Machinery	3	1	0	4	PC	N	ME
5	M313B	Metrology and Machine Tools	3	0	0	3	PC	N	ME
6	M3131	Dynamics of Machinery lab	0	0	2	1	PC	N	ME
7	M3132	Metrology and Machine Tools Lab	0	0	2	1	PC	N	ME
8	M3101	Life Skills and Professional Skills Lab	0	0	4	2	HS	N	ENGLISH
9	M31M3	Artificial Intelligence	2	0	0	0	MC	Y	CSE
10	M31AC3	Indian Constitution	2	0	0	0	AC	Y	MBA
Total			**19**	**2**	**8**	**21**			

III Year II Semester

S. No.	Code	Course Title	L	T	P	C	Category	common subject (Y/N)	Approving BOS
1	BTMEE2	Professional Elective – II	3	0	0	3	PE	N	ME
2	BTMEE3	Professional Elective – III	3	0	0	3	PE	N	ME
3	BTMEO2	Open Elective – II	3	0	0	3	OE		
4	M323A	Machine Design	3	1	0	4	PC	N	ME
5	M323B	Heat Transfer	3	0	0	3	PC	N	ME
6	M3231	Heat Transfer Lab	0	0	2	1	PC	N	ME
7	M3232	Computer Aided Manufacturing and Rapid Prototyping Lab	0	0	2	1	PC	N	ME
8	M3233	Internship - II	0	0	2	1	PW	N	ME
9	M32MC4	Cyber Security	2	0	0	0	MC	Y	IT
10	M32AC4	Foundations of Entrepreneurship	2	0	0	0	AC	Y	MBA
Total			**19**	**1**	**6**	**19**			

B. Tech. Course Structure

IV Year I Semester

S. No.	Code	Course Title	L	T	P	C	Category	common subject (Y/N)	Approving BOS
1	BTMEE4	Professional Elective – IV	3	0	0	3	PE	N	ME
2	BTMEE5	Professional Elective – V	3	0	0	3	PE	N	ME
3	BTMEO3	Open Elective – III	3	0	0	3	OE		
4	M413A	Refrigeration and Air Conditioning	3	0	0	3	PC	N	ME
5	M413B	CAD/CAM	3	0	0	3	PC	N	ME
6	M4132	Industry Oriented Mini Project	0	0	4	2	PW	N	ME
7	M4133	Major Project Phase-I	0	0	4	2	PW	N	ME
8	M4131	Computer Aided Engineering Lab	0	0	2	1	PC	N	ME
9	M41M3	3D Printing and Design	2	0	0	0	MC	N	ME
Total			**17**	**0**	**10**	**20**			

IV Year II Semester

S. No.	Code	Course Title	L	T	P	C	Category	common subject (Y/N)	Approving BOS
1	BTMEE6	Professional Elective – VI	3	0	0	3	PE	N	ME
2	BTMEO4	Open Elective – IV	3	0	0	3	OE		
3	M423A	Renewable Energy Sources	3	0	0	3	PC	N	ME
4	M4231	Major Project Phase-II	0	0	20	10	PW	N	ME
8	M4232	Seminar	0	0	2	1	PW	N	ME
Total			**9**	**0**	**22**	**20**			

Note: All End Examinations (Theory and Practical) are of three-hour duration.

L – Lecture, T – Tutorial, P – Practical, D – Drawing, C – Credits.

B. Tech. Course Structure

Professional Elective-I									
S. No.	**Code**	**Course Title**	**L**	**T**	**P**	**C**	**Category**	**common subject (Y/N)**	**Approving BOS**
1	M313C	Solar Energy Technology	3	0	0	3	PE	N	MECH
2	M313D	Automobile Engineering	3	0	0	3	PE	N	MECH
3	M313E	Power Plant Engineering	3	0	0	3	PE	N	MECH

Professional Elective-II									
S. No.	**Code**	**Course Title**	**L**	**T**	**P**	**C**	**Category**	**common subject (Y/N)**	**Approving BOS**
1	M323C	Unconventional Machining Processes	3	0	0	3	PE	N	MECH
2	M323D	Theory of Metal Cutting	3	0	0	3	PE	N	MECH
3	M323E	Machine Tool Design	3	0	0	3	PE	N	MECH

Professional Elective-III									
S. No.	**Code**	**Course Title**	**L**	**T**	**P**	**C**	**Category**	**common subject (Y/N)**	**Approving BOS**
1	M323F	Operations Research	3	0	0	3	PE	N	MECH
2	M323G	Robotics	3	0	0	3	PE	N	MECH
3	M323H	Product Development	3	0	0	3	PE	N	MECH

Professional Elective-IV									
S. No.	**Code**	**Course Title**	**L**	**T**	**P**	**C**	**Category**	**common subject (Y/N)**	**Approving BOS**
1	M413C	Finite Element Methods	3	0	0	3	PE	N	MECH
2	M413D	Quality Engineering in Manufacturing	3	0	0	3	PE	N	MECH
3	M413E	CNC Technology	3	0	0	3	PE	N	MECH

Professional Elective-V (Mandatory MOOC)									
S. No.	Code	Course Title	L	T	P	C	Category	common subject (Y/N)	Approving BOS
1	M413F	Computer Integrated Manufacturing	3	0	0	3	PE	N	MECH
2	M413G	Introduction to Mechanical Micro Machining	3	0	0	3	PE	N	MECH
3	M413H	Product Design and Manufacturing	3	0	0	3	PE	N	MECH

Professional Elective-VI									
S. No.	Code	Course Title	L	T	P	C	Category	common subject (Y/N)	Approving BOS
1	M423B	Additive Manufacturing	3	0	0	3	PE	N	MECH
2	M423C	Automation in Manufacturing	3	0	0	3	PE	N	MECH
3	M423D	Production Planning and Control	3	0	0	3	PE	N	MECH

Open Elective-I					
S. No.	**Code**	**Course Title**	**L**	**Credits**	**Approving BOS**
1	M311OA	Elements of Civil Engineering	3	3	CE
2	M312OB	Energy Engineering	3	3	EEE
3	M313OC	Basics of 3D Printing	3	3	ME
4	M314OD	Digital Electronics for Engineering	3	3	ECE
5	M315OE	Introduction to Computer Networks	3	3	CSE
6	M316OF	Open Source Softwares	3	3	IT
7	M317OG	Introduction to Natural Language Processing	3	3	ECM
8	M31AOH	Introduction to Machine Learning	3	3	AIML
9	M31AOI	Introduction to Machine Learning	3	3	CSE (AIML)
10	M31DOJ	Introduction to Data Science	3	3	AIDS
11	M31DOK	Data Science for Health Care	3	3	CSE (DS)

Open Elective-II					
S. No.	**Code**	**Course Title**	**L**	**Credits**	**Approving BOS**
1	M321OA	Construction Management, Contracts and valuation	3	3	CE
2	M322OB	Sensors and Transducers	3	3	EEE
3	M323OC	Basics of Robotics	3	3	ME
4	M324OD	Principles of Communications	3	3	ECE
5	M325OE	Principles of Operating Systems	3	3	CSE
6	M326OF	Distributed Systems	3	3	IT
7	M327OG	Introduction to R-Programming	3	3	ECM
8	M32AOH	Introduction to Neural Networks	3	3	AIML
9	M32AOI	Introduction to Neural Networks	3	3	CSE (AIML)
10	M32DOJ	Introduction to Big Data	3	3	AIDS
11	M32DOK	Data Science Applications	3	3	CSE (DS)

Open Elective-III					
S. No.	**Code**	**Course Title**	**L**	**Credits**	**Approving BOS**
1	M411OA	Sustainable Infrastructure Development	3	3	CE
2	M412OB	Electrical Engineering Materials	3	3	EEE
3	M413OC	Fundamentals of Product Development	3	3	ME
4	M414OD	Electronic Sensors	3	3	ECE
5	M415OE	Introduction to Java Programming	3	3	CSE
6	M416OF	Object Oriented Analysis and Design	3	3	IT
7	M417OG	Introduction to R-Programming	3	3	ECM
8	M41AOH	Introduction to Deep Learning	3	3	AIML
9	M41AOI	Introduction to Deep Learning	3	3	CSE (AIML)
10	M41DOJ	Fundamentals of Cloud Computing	3	3	AIDS
11	M41OK	Basics of R-Programming	3	3	CSE (DS)

Open Elective-IV					
S. No.	**Code**	**Course Title**	**L**	**Credits**	**Approving BOS**
1	M421OA	Environmental Pollution and Control	3	3	CE
2	M422OB	Special Electrical Machines	3	3	EEE
3	M423OC	Automotive Technology	3	3	ME
4	M424OD	Consumer Electronics	3	3	ECE
5	M425OE	Introduction to Python Programming	3	3	CSE
6	M426OF	Cyber Laws & Ethics	3	3	IT
7	M427OG	Introduction to Image Processing	3	3	ECM
8	M42AOH	Introduction to Generative Adversarial Networks	3	3	AIML
9	M42AOI	Introduction to Generative Adversarial Networks	3	3	CSE (AIML)
10	M42DOJ	Business Data Analytics	3	3	AIDS
11	M42DOK	Introduction to data science	3	3	CSE (DS)

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year-I Sem			
Course Code: **M110A**	**MATRICES AND CALCULUS** (COMMON TO: CE, EEE, ME, ECE, CSE, IT, ECM, CSE(DS), CSE(AIML), AIML, AIDS)	L	T	P	C
		3	**1**	**0**	**4**

Pre-Requisites: Mathematical Knowledge at pre-university level

Module 1: Matrices and system of equations [10L]

Types of Matrices, Symmetric, Skew-symmetric, rank of a matrix by Echelon form and Normal form, Gauss elimination, Inverse of non-singular matrices by Gauss-Jordan method. System of linear equations, solving system of Homogeneous and Non-Homogeneous equations.

Module 2: Eigen values, Eigen Vectors [8 L]

Eigen values, Eigen vectors and their properties, Diagonalization of matrix. Calculation of powers of Matrix, Cayley - Hamilton theorem (without proof), Inverse and powers of a matrix using Cayley - Hamilton theorem.

Module 3: Quadratic Forms [8 L]

Definitions of Hermitian, Skew-Hermitian, orthogonal matrices, Unitary Matrices, Linear Transformation and Orthogonal Transformation, Quadratic forms, rank and nature of the quadratic forms, index and signature, reduction of quadratic forms into canonical form using Linear Transformation and Orthogonal Transformations.

Module 4: Mean value theorems and Functions of Multi variables [12L]

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

Functions of Multi variables: Limits, Continuity, Partial differentiation, partial derivatives of first and second order, Jacobian, Taylor's theorem of two variables (without proof). Maxima and Minima of two variables, Lagrange's method of undetermined Multipliers.

Module 5: Improper and Multiple Integrals [12L]

Definition of Improper Integrals, Beta functions: Properties and other forms of beta functions (statements only) and problems, Gamma functions: Properties of Gamma functions (statements only), Relation between the Beta and Gamma functions (without proofs) and Evaluation of improper integrals using Beta and Gamma functions

Evaluation of double integrals, change of order of integration, change of variables, evaluation of triple integrals, change of variables.

Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2015
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
3. R.K.Jain & S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2019.

Reference Books

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11thReprint, 2010.

E-Resources

1. https://nptel.ac.in/courses/111/108/111108098/
2. https://en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors
3. https://nptel.ac.in/courses/111/107/111107108/
4. https://www.cheric.org/files/education/cyberlecture/e200303/e200303-301.pdf
5. https://www.whitman.edu/mathematics/calculus_online/chapter16.html

Course Objectives:

1. Types of matrices and their properties.
2. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
3. Concept of eigenvalues and eigenvectors and to reduce the quadratic form to canonical form Geometrical approach to the mean value theorems and their application to the mathematical problems
4. Evaluation of surface areas and volumes of revolutions of curves.
5. Evaluation of improper integrals using Beta and Gamma functions.
6. Partial differentiation, concept of total derivative
7. Finding maxima and minima of function of two and three variables.
8. Evaluation of multiple integrals and their applications

Course outcomes:

After learning the contents of this paper, the student must be able to

1. Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
2. Find the Eigenvalues and Eigen vectors
3. Reduce the quadratic form to canonical form using orthogonal transformations.
4. Solve the applications on the mean value theorems.
5. Evaluate the improper integrals using Beta and Gamma functions
6. Find the extreme values of functions of two variables with/ without constraints.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes (PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year-I Sem			
Course Code: **M110B**	**APPLIED PHYSICS** (COMMON TO: CE, ME, CSE(AIML), CSE(DS), AIDS, AIML)	L	T	P	C
		3	**1**	**0**	**4**

Pre-Requisites: 10+2 Physics

Course Objectives:

The students will be able to

1. Study the characteristics of lasers and optical fibres.
2. Understand the basic principles of quantum mechanics and band theory of solids.
3. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
4. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
5. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.

Unit-1: LASERs and Optical fibers [10L]

Module I: LASERs [5L]

Introduction, Properties of laser beam- Monochromaticity, coherence, directionality and brightness; Einstein co-efficients, Population inversion, Types of Lasers: Ruby laser, He-Ne laser, Semiconductor laser, Applications of lasers.

Module II: Optical fibers [5L]

Introduction, Principle and construction of an optical fiber, Total Internal reflection, Acceptance angle, Numerical aperture, Types of optical fibers (Single mode, multimode, step index, graded index), losses in optical fibers, Optical fiber communication system with block diagram and Applications of optical fibres.

Unit-2: Fundamentals of Quantum Mechanics and Band theory of solids [10L]

Module I: Fundamentals of Quantum Mechanics [6L]

Introduction to quantum physics, Black body radiation, Planck's radiation law, Photoelectric effect, de-Broglie hypothesis, Davisson and Germer's experiment, Concept of wave function, Heisenberg uncertainty principle, Time independent Schrödinger wave equation, Particle in one dimensional infinite potential well

Module II: Band theory of solids: [4L]

Free electron theory (Drude & Lorentz, Sommerfeld) (Qualitative), Bloch's theorem, Kronig-Penney model (Qualitative), E-K diagram, Effective mass of electron, Origin of energy bands- classification of solids.

Unit-3: Semiconductor Physics and Devices [9L]

Module I: Semiconductor Physics [5L]

Density of states, Intrinsic semiconductor, Intrinsic carrier concentration, Extrinsic semiconductors (Qualitative), Fermi level and its temperature dependence, Hall effect-Hall coefficient, Applications of Hall effect.

Module II: Semiconductor Devices [4L]

Direct and indirect bandgap semiconductor, Formation of PN junction, Working of PN junction diode in forward and reverse bias, V-I Characteristics, Zener diode, LED, Photo diode and Solar cell, their structure, working principle and characteristics.

Unit-4: Dielectric, Energy and Magnetic materials [10L]

Module I: Dielectric and Energy materials [5L]

Introduction, Types of polarizations-electronic, ionic and orientation polarizations; Internal field and Clausius-Mossotti, Piezoelectricity, Pyroelectricity and Ferroelectricity and their applications. Energy materials-Materials and electrolytes for super capacitors-Rechargeable ion batteries- Lithium ion and sodium ion batteries, solid fuel cells.

Module II: Magnetic materials [5L]

Introduction, Origin of magnetic moment, Bohr magneton, Classification of dia, para and ferro magnetic materials on the basis of magnetic moment, Hysteresis curve based on domain theory, Soft and hard magnetic materials, Properties of antiferro and ferri magnetic materials.

Unit-5: Nanoscience and Characterization techniques [9L]

Module I: Nanoscience [5L]

Introduction of nanomaterials, Surface area to Volume ratio, Quantum confinement, Top-down fabrication: Ball milling and Chemical Vapor Deposition (CVD) methods, Bottom-up fabrication: Sol-Gel and Combustion methods.

Module II: Characterization techniques [4L]

X-Ray Diffraction (XRD), Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM), Scanning Tunnelling Microscope (STM), Applications of nanomaterials.

Text Books

1. M.N. Avadhanulu and P.G. Kshirsagar, TVS Aruna Murthy "A Text Book Engineering Physics", S. Chand, 2019.
2. P. K. Palanisamy, "Engineering Physics", Scitech Publications.
3. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.
4. Wahab M A, 'Solid state physics-Structure and properties of materials' Narosa publication.
5. R.L.Singhal, " Solid state physics", KNRN publication.
6. Elementary Solid State Physics , S.L. Gupta and V. Kumar, pragati prakashan, 2019.
7. A.K. Bhandhopadhya-Nano materials, New age international, 1 st edition, 2007.

Reference Books

1. P. Bhattacharya, "Semiconductor Optoelectronic Devices", Prentice Hall of India (1997).
2. S.O. Pillai, "Solid State Physics", New Age International Publishers
3. J. Singh, "Semiconductor Optoelectronics", Physics and Technology, McGraw-Hill Inc. (1995).
4. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.

E-Resources

1. http://nptel.ac.in/courses/113104012/
2. http://www.springer.com/physics/journal/340 .
3. https://www.researchgate.net/publication/259574083 Lecture Notes on Engineering Physics
4. https://www.researchgate.net/publication/292607115_Applied Physics.

Course Outcomes

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

CO1. Describe the working of various types of lasers and explain the fundamentals of fiber optics.

CO2. Apply Schrodinger time independent wave equation to show energy of a particle in 1D potential box is quantized.

CO3. Explain the working of p-n junction diode in forward bias and reverse bias.

CO4. Classify the magnetic materials into hard and soft magnetic materials based on hysteresis loop area.

CO5. Prepare nanomaterials for applications in various fields of engineering.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes (PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	2	2	1	-	-	-	-	-	-	-	-	-	1	-
CO2	3	1	2	-	-	-	-	-	-	-	-	-	1	-
CO3	2	1	2	-	-	-	-	-	-	-	-	-	1	-
CO4	2	2	1	-	-	-	-	-	-	-	-	-	1	-
CO5	2	2	1	-	-	-	-	-	-	-	-	-	2	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**-**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year-I Sem			
Course Code: **M112A**	**BASIC ELECTRICAL ENGINEERING** (Common to CE, ME, AIML, CSM, AIDS & CSD)	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Mathematics and Physics

COURSE OBJECTIVES

The students will

CO1: Apply Kirchhoff's laws to analyse complex DC circuits, demonstrating comprehension and application skills in electrical engineering.

CO2: Analyse the behaviour of AC circuits, showcasing evaluation skills in understanding electrical phenomena, including resonance.

CO3: Explain the principles of transformer operation and analyse their behaviour, applying concepts of electromagnetic induction.

CO4: Select and operate suitable DC motors and three-phase induction motors for various industrial applications, synthesizing motor principles effectively.

CO5: Demonstrate proficiency in basic electrical installations and the use of fundamental measurement instruments for practical electrical applications, ensuring strict adherence to safety protocols and standards.

UNIT 1: DC CIRCUITS AND CIRCUIT ELEMENTS [10 L]

MODULE -I: D.C CIRCUIT CONCEPTS AND CIRCUIT ELEMENTS

Voltage – current – power and energy – active and passive elements – voltage and current sources – source conversions – open circuit – short circuit – statement of Ohm's law - Kirchhoff's Laws – loop current method – node voltage method of solving the electrical network – resistance – laws of resistance – temperature coefficient of resistance – resistors in series and parallel – uses of resistor.

MODULE -II: ENERGY STORING ELEMENTS

Inductor – inductance – V-I relation – power – energy stored in inductor – inductors in series and parallel – uses of Inductors – capacitor – capacitance – V-I relation – power – energy stored in capacitor – capacitor in series and parallel – uses of capacitor.

UNIT 2: AC CIRCUITS [10 L]

MODULE -I: SINGLE PHASE AC CIRCUITS

Alternating quantity – cycle – time period – frequency – Amplitude – RMS – average value – form and peak factors – phase and phase difference – AC through R, L, C, RL, RC and RLC series circuits – resonance in series RLC circuit.

MODULE -II: THREE PHASE AC CIRCUITS

Phase sequence – three phase connections – relationship between line and phase value of voltage and current in star and delta connections – power in three phase circuit.

UNIT 3: STATIC ELECTRIC MACHINE [8 L]

MODULE -I: FUNDAMENTALS OF SINGLE-PHASE TRANSFORMER

Single phase transformer – Principle – constructional details – parts – types (core and shell type) – equivalent circuit - EMF equation.

MODULE -II: TRANSFORMER PERFORMANCE AND APPLICATIONS

Losses – efficiency – regulation – applications.

UNIT 4: DC AND AC MACHINES [8 L]

MODULE -I: DC MOTOR

D.C Motor – principle – constructional details – DC series – DC shunt motor – torque current and speed current characteristics – applications.

MODULE -II: THREE-PHASE INDUCTION MOTOR

Three-phase induction motor – principle – construction – generation of rotating magnetic field – torque slip characteristics.

UNIT 5: ELECTRICAL INSTALLATIONS AND MEASURING INSTRUMENTS [9 L]

MODULE -I: ELECTRICAL INSTALLATIONS: Components of LT switchgear: Switch fuse unit (SFU) – MCB – MCCB – earthing.

MODULE -II: MEASURING INSTRUMENTS: Construction – working principle of PMMC and MI type instruments – advantages – disadvantages – applications.

TEXT BOOKS

T1: D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition, 2019.

T2: V.K. Mehta and Rohit Mehta, "Principles of Electrical Engineering and Electronics", S. Chand & Company Ltd, 2012.

T3: L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.

T4: A.K.Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", Dhanapath Rai and Sons., 10th Edition, 2007.

REFERENCE BOOKS

R1: Dr. Ramana Pilla, Dr. M. Suryakalavathi, "Basic Electrical Engineering", S. Chand & Company Ltd, 2018.

R2: V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

E-RESOURCES

E1: https://onlinecourses.swayam2.ac.in/nou21_ee02/preview
E2: https://nptel.ac.in/courses/108/108/108108076/
E3: https://www.electrical4u.com

COURSE OUTCOMES

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

CO1: Analyse and solve complex DC circuits using Kirchhoff's laws.

CO2: Calculate and analyse the behaviour of single-phase and three-phase AC circuits, including resonance phenomena.

CO3: Understand the principles of operation and applications of transformers in electrical systems.

CO4: Expertise in the principles and applications of DC motors and three-phase induction motors, enabling them to select and operate suitable machines for various industrial purposes.

CO5: Develop foundational skills in basic electrical installations and using fundamental measurement instruments for practical electrical applications.

CO - PO & PSO MAPPING

CO/PO & PSO	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	1	1	1	-	-	-	-	1	2	1
CO2	3	3	3	2	1	1	1	-	-	-	-	1	2	1
CO3	3	3	3	2	1	1	1	-	-	-	-	1	2	1
CO4	3	3	3	2	1	1	1	-	-	-	-	1	2	1
CO5	3	3	3	2	1	1	1	-	-	-	-	1	2	1

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year-I Sem			
Course Code: **M1132**	**ELEMENTS OF MECHANICAL ENGINEERING**	L	T	P	C
		2	**0**	**0**	**1**

Pre-Requisites: Basic Knowledge of Physics.

Module 1: Introduction to Mechanical Engineering

Evolution of mechanical engineering. Role of mechanical engineering in various industries. Overview of different branches and specializations within mechanical engineering.

Module 2: Engineering Materials

Classification of materials: metals, ceramics, polymers, and composites. Properties of engineering materials: mechanical, thermal, electrical, and magnetic properties. Material selection for engineering applications. Introduction to material testing and characterization.

Module 3: Thermodynamics

Basic concepts: system, surroundings, state, process, and cycle. Laws of thermodynamics: zeroth, first, second, and third laws. Thermodynamic properties of pure substances. Applications of thermodynamics: power generation, refrigeration, and air conditioning.

Module 4: Manufacturing Processes

Overview of manufacturing processes: casting, forming, machining, and welding. Introduction to additive manufacturing and 3D printing. Fundamentals of CNC machining. Quality control and inspection methods in manufacturing.

Module 5: Introduction to Mechatronics and Robotics

Basic concepts of mechatronics and its applications. Overview of sensors, actuators, and controllers. Introduction to robotics: types of robots and their applications. Basics of robotic kinematics and programming.

Text Books

1. "Materials Science and Engineering: An Introduction" by William D. Callister Jr. and David G. Rethwisch.
2. "Fundamentals of Thermodynamics" by Richard E. Sonntag and Claus Borgnakke.
3. "Manufacturing Engineering and Technology" by Serope Kalpakjian and Steven R. Schmid.
4. "Introduction to Mechatronics and Measurement Systems" by David G. Alciatore and Michael B. Histand.

Course Outcomes

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

CO1. Grasp the basic principles and concepts of mechanical engineering, including the history and evolution of the field.

CO2. Recognize different types of engineering materials (metals, ceramics, polymers, and composites) and understand their properties and applications.

CO3. Understand and apply the laws of thermodynamics to various engineering systems, including power generation and refrigeration.

CO4. Describe various manufacturing processes such as casting, forming, machining, and welding, and understand the basics of additive manufacturing and CNC machining.

CO5. Explain the basic concepts of mechatronics and robotics, including sensors, actuators, controllers, and robotic kinematics.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	2	2	-	-	-	-	-	-	-	3	1	-
CO2	3	2	2	2	-	-	-	-	-	-	-	3	2	-
CO3	3	2	2	2	-	-	-	-	-	-	-	3	2	-
CO4	3	2	1	3	-	-	-	-	-	-	-	3	2	-
CO5	3	2	1	3	-	-	-	-	-	-	-	3	2	-
Average	3	2	1.6	2.4	-	-	-	-	-	-	-	3	1.8	-

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous)	B. Tech: ME I Year- I Sem			
Course Code: **M115B**	**PROGRAMMING FOR PROBLEM SOLVING** (Common to all branches)	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Mathematical Knowledge, Analytical Skills.

Course objectives: The Student will:

1. Learn the fundamentals of computers.
2. Understand the various steps in program development.
3. Understand the syntax and semantics of C programming language.
4. Learn the usage of structured programming approach in solving problems.
5. Gain the knowledge on searching and sorting methods.

Module 1:

Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming.

Introduction to C Programming Language: Basic concepts of a C program, Declaration, Assignment & Print statement, Types of operators and expressions, Programming examples and exercise. variables (with data types and space requirements),

Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments

Bitwise operations: Bitwise AND, OR, XOR and NOT operators Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switchcase, ternary operator, goto, Iteration with for, while, do- while loops.I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr.

Module 2: ARRAYS, STRINGS, STRUCTURES AND PREPROCESSOR:

Arrays: one- and two-dimensional arrays, creating, accessing and manipulating elements of arrays.

Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings Structures: Defining structures, initializing structures, unions, Array of structures. **Preprocessor**: Commonly used Preprocessor commands like include, define, undef, If, ifdef, ifndef.

Module 3: POINTERS AND FILE HANDLING IN C:

Pointers: Idea of pointers, defining pointers, Pointers to Arrays and Structures, Use of Pointers inself-referential structures, usage of self-referential structures in linked list (no implementation) Enumeration data type. Array of pointers,

Files: Text and Binary files, Creating and Reading and writing text and binary files, appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

Module 4: FUNCTION AND DYNAMIC MEMORY ALLOCATION:

Functions: Designing structured programs, declaring a function, Signature of a function, Parameters and return type of a function, passing parameters to functions, call by value, passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries.

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions.

Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of different data types..

Dynamic allocations methods- malloc(), calloc(), realloc(),free(),

Module 5: INTRODUCTION TO ALGORITHMS:

Basic searching algorithms (linear and binary search techniques), Basic sorting algorithms (Bubble, Insertion, Quick, Merge and Selection sort algorithms) Basic concept of order of complexity through the example programs

Textbooks

1. Ream Thareja, Programming in C, Oxford university press.
2. B.A. Forouzan and R.F. Gilberg, C Programming and Data Structures, Cengage Learning, (3rdEdition).

Reference Books

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall.
2. R.G. Dromey, How to solve it by Computer, Pearson (16thImpression)
3. Stephen G. Kochan, Programming in C, Fourth Edition, PearsonEducation.
4. Herbert Schildt, C: The Complete Reference, McGraw Hill, 4thEdition
5. Byron Gottfried, Schaum"sOutline of Programming with C,McGraw-Hil

E - Resources:

1. https://fresh2refresh.com/c-programming/
2. https://www.studytonight.com/c/
3.https://beginnersbook.com/2014/01/c-tutorial-for-beginners-with examples/
4. https://www.programiz.com/c-programming
5.http://www.gtucampus.com/uploads/studymaterials/Degree%20EngineeringSandipFundaments_of_C.pdf

6.http://cs.indstate.edu/~cbasavaraj/cs559/the_c_programming_language_2.pdf

Course Outcomes

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

CO1. Design the algorithms/flowcharts of C-programs

CO2 . Write the Code and test a given logic in C programming language

CO3 Decompose a problem into functions and to develop modular reusable code.

CO4. Make Use of arrays, pointers, strings and structures to write C Programs.

CO5 Apply searching and sorting algorithms

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year- I Sem			
Course Code: **M1101**	**PHYSICS LABORATORY** (Common to CE, ME, AIML, CSM, AIDS & CSD)	L	T	P	C
		0	**0**	**2**	**1**

Pre-Requisites: 10+2 Physics basic concepts.

List of Experiments:

1:Energy gap of P-N junction diode:

To determine the energy gap of a semiconductor diode.

2. Solar Cell:

To study the V-I Characteristics of solar cell.

3. Light emitting diode and Laser Diode:

Plot V-I characteristics of light emitting diode and Laser diode.

4. Optical fiber:

Determination of Numerical Aperture of an optical fibre.

5. Hall effect:

To determine Hall co-efficient of a given semiconductor.

6. Photoelectric effect

To determine work function of a given material.

7. Dielectric Constant

To determine the Dielectric constant of the given material.

8. LCR Circuit

To determine the Quality factor of LCR Circuit (Series & Parallel).

9. R-C Circuit

To determine the time constant of R-C circuit (Growth and Decay).

10.Melde's Experiment

To determine the frequency of a vibrating bar or turning fork using Melde's arrangement.

11. Torsional Pendulum

To determine the rigidity modulus of the material of the given wire using torsional pendulum.

12.Sonometer

To determine the frequency of AC Supply sonometer.

Note: Any 10 experiments are to be performed.

Text Books

1.Dr. Narendra, L. Mathakari,"Experiments in Applied Physics" (Physics Lab Manual 4th edition) ,

2."Engineering Physics Lab Resources" By Department of Physics JBIET.

Course Outcomes

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

1. Learn the experimental concepts on in LED, Electric and Electronics materials.
2. Get the knowledge of fundamentals of Semiconductor physics.
3. Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications.
4. Be exposed to the phenomena of waves, oscillations and optics.
5. Lasers and fiber optics enable the students to apply to various systems like communications, solar cell, photo cells and so on.

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year-I Sem			
Course Code: **M1121**	**BASIC ELECTRICAL ENGINEERING LAB** (Common to CE, ME, AIML, CSM, AIDS & CSD)	L	T	P	C
		0	**0**	**2**	**1**

Pre-Requisites: Mathematics and Physics

COURSE OBJECTIVES

The students will

COB1: Proficiently apply fundamental electrical principles, including Ohm's Law and circuit analysis techniques, to determine the values of unknown resistances.

COB2: Demonstrate mastery in validating circuit behaviours through the application of Kirchhoff's Voltage Law and Kirchhoff's Current Law.

COB3: Showcase understanding of time-dependent behaviour in electrical components by investigating the transient responses of series RL and RC circuits to DC excitation.

COB4: Explore resonance phenomena in series RLC circuits, identifying the frequency at which impedance is minimized and current is maximized, thus exhibiting proficiency in frequency-domain analysis.

COB5: Equip students to evaluate the performance characteristics of DC shunt motors and single-phase transformers, enabling them to assess their suitability for specific applications in electrical systems.

List of Experiments

1. Verification of Ohms Law.
2. Determination of unknown resistance.
3. Verification of KVL and KCL.
4. Transient response of series RL and RC circuits using DC excitation.
5. Transient response of RLC series circuit using DC excitation.
6. Resonance in series RLC circuit.
7. Calculations and verification of impedance and current of RL, RC and RLC series circuits.
8. Measurement of voltage, current and real power in primary and secondary circuits of a single phase transformer.
9. Performance Characteristics of a DC Shunt Motor.
10. Load test on single phase transformer (Calculate Efficiency and Regulation)

COURSE OUTCOMES

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

CO1: Apply Ohm's Law and circuit analysis techniques to determine the value of unknown resistances, showcasing proficiency in fundamental electrical principles.

CO2: Validate principles of circuit behaviour using Kirchhoff's Voltage Law and Kirchhoff's Current Law.

CO3: Investigate the transient responses of series RL and RC circuits to DC excitation, demonstrating an understanding of time-dependent behaviour in electrical components.

CO4: Explore resonance phenomena in series RLC circuits, identifying the frequency at which impedance is minimized and current is maximized, showcasing proficiency in frequency-domain analysis.

CO5: Evaluate the performance characteristics of DC shunt motors and single-phase transformers, to assess their suitability for specific applications in electrical systems.

CO - PO & PSO MAPPING

CO/PO & PSO	POs												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	3	3	2	1	1	1	1	1	-	-	1	2	1
CO2	3	3	3	2	1	1	1	1	1	-	-	1	2	1
CO3	3	3	3	2	1	1	1	1	1	-	-	1	2	1
CO4	3	3	3	2	1	1	1	1	1	-	-	1	2	1
CO5	3	3	3	2	1	1	1	1	1	-	-	1	2	1

AY: 2024-25 Onwards	J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous)	B. Tech: ME I Year- I Sem			
Course Code: **M1151**	**PROGRAMMING FOR PROBLEM SOLVING LAB** (Common to all)	L	T	P	C
		0	**0**	**2**	**1**

Pre-Requisites: Mathematical Knowledge, Analytical Skills.

Course objectives:

The Student will:

1. Work with an IDE to create, edit, compile, run and debug programs
2. Analyse the various steps in program development.
3. Develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
4. Develop modular, reusable, and readable C Programs using the concepts like functions, arrays etc.
5. Write programs using the Dynamic Memory Allocation concept, files

Lab Experiments:

1. a) Write a program to find the max and min from the three numbers.

b) Write a program to read marks from keyboard and your program should display equivalent grade according to following table (if else ladder)

Marks Grade
100 – 80 Distinction
79 – 60 First Class
59 – 40 Second Class
< 40 Fail

2. Write a C program, which takes two integer operands and one operator from the user, performs the operation, and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
3. Write a program that finds if a given number is a prime number
4. Write a C program to generate the first n terms of the sequence
5. Write a C program to find the minimum, maximum and average in an array of integers.
6. Write a C program to find Addition and Multiplication of Two Matrices
7. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.
8. 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.)

9.a) Write a C program to implement binary search algorithm.

b) Write a C program to implement linear search algorithm.

10. a) Write a C program that implements the Bubble sort method.

b) Write a C program that implements the Insertion sort method.

11. Write a C program that implements the Quick sort method.

12. Write a C program that implements the Merge sort method.

13. Recursion: factorial, Fibonacci, GCD.

Case Studies:

1. Implement Hotel Management system in C with the following requirements.

Requirements:

-Provide the information on reserving rooms, book an event, check the features

- Give the login for both admin and user for proper login validation

-Add/View/Edit/Delete user records

-Calculate the bill after checkout of customers

2. Implement Library management system in C with the following requirements.

Requirements:

-To add Book Information

- Display Book Information

-List all the books of the given author

-List the title of the specified Book

-List the count of books in the library

Course Outcomes

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

CO1 Formulate the algorithms for simple problems

CO2 Examine syntax errors as reported by the compilers

CO3 Define and manipulate data with arrays, strings, and structures

CO4 Make use of pointers with different function types

CO5 Create, read, and write to and from simple text and binary files

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year-I Sem			
Course Code: **M1131**	**ENGINEERING WORKSHOP AND DIGITAL FABRICATION** (Common to CE, ME, AIML, CSM, AIDS & CSD)	L	T	P	C
		1	**0**	**4**	**2.5**

Pre-Requisites: Basic knowledge about tools and different trades

List of Experiments.

1. To make a Half Lap joint from the given Wooden pieces.
2. To make a Dovetail joint from the given Wooden pieces.
3. To make a Rectangular Scoop using the given Sheet metal.
4. To make a Hooper using the given Sheet metal.
5. To perform Parallel and Series wiring connection.
6. To perform Stair case wiring connection.
7. To make a Square rod from a given round rod.
8. To make a S- hook from a given round rod.
9. To prepare a sand mould for the given single piece pattern.
10. To prepare a sand mould for the given Split-piece pattern.
11. To make a Straight fitting from the given metal pieces.
12. To make a V- shape fitting from the given metal pieces

Demonstration

13. 3D Printing of modeled component by varying Layer thickness.
14. 3D Printing of modeled component by varying Orientation.
15. 3D Printing of modeled component by varying Infill.

Text Books

1. K. C. John, "Mechanical Workshop Practice", PHI Publishers, 2nd Edition,2010.
2. Ben Redwood, "The 3D Printing Handbook", 3D HUBS, 2018.

Course Outcomes

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

CO1. know the importance of general safety precautions on different shop floors.

CO2. identify the basic tools and equipments used in fitting, carpentry, sheet metal, machine shop, welding and smithy.

CO3. familiarize with the production of simple models in carpentry, sheet metal, machine, welding and smithy trades.

CO4. Gain the knowledge on different 3D Printing techniques.

CO5: Perform the printing of the different components using FDM 3D printer.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes (PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	-	-	-	2	2	2	3	3	3
CO2	-	-	-	-	-	-	-	-	2	2	2	3	3	1
CO3	-	-	-	-	-	-	-	-	2	2	2	3	3	3
CO4	-	-	-	-	-	-	-	-	2	2	2	3	3	3
CO5	-	-	-	-	-	-	-	-	2	2	2	3	3	2
Average	-	-	-	-	-	-	-	-	2	2	2	3	3	2.4

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year-I Sem			
Course Code: **M11AC1**	**LINGUASKILL FOR PROFESSIONALS – B1** (COMMON TO CSE, IT, ECM, ECE, EEE)	L	T	P	C
		2	**0**	**0**	**0**

Pre-Requisites: NIL

COURSE OBJECTIVES:

To enable students

1. Acquire an extensive range of vocabulary related to diverse topics.
2. Enhance pronunciation skills, focusing on specific sounds and intonation patterns
3. Improve the use of various grammar concepts
4. Strengthen listening, speaking, reading, and writing skills across different proficiency levels
5. Develop practical language skills for everyday communication scenarios

Module 1(6L)

UNIT-1

Grammar: Subject-Object, Present Tense

Vocabulary: Words about friendship, communication, work and technology

Pronunciation: Word stress, sentence stress

UNIT-2

Everyday English: Opinions and suggestions

- **Listening:** Listening Activity 1, Listening Activity 2
- **Reading:** Reading Activity 1, Reading Activity 2
- **Speaking:** Speaking Activity 1, Speaking Activity 2

Writing: Guide, Email giving news

Module 2 (6L)

UNIT-1

Grammar: Modals, Phrases of ability, Articles, *used to* and *usually*

Vocabulary: Words about relationship and ability

Pronunciation: Linking sounds, Intonation in question tags

UNIT -2

Everyday English: Telling a story; Offering and asking for help

- **Listening:** Listening Activity 1, Listening Activity 2
- **Reading:** Reading Activity 1, Reading Activity 2
- **Speaking:** Speaking Activity 1, Speaking Activity 2

Writing: About someone's life, online advertisement

Module 3 (6L)

UNIT-1

Grammar: Future forms, zero and first conditionals, comparatives and superlatives

Vocabulary: Words about the natural world, environmental issues and food

Pronunciation: Sound and spelling 'a', /ʃ/, /tʃ/

UNIT-2

Everyday English: Giving reasons, results and examples; Asking and giving recommendations

- **Listening:** Listening Activity 1, Listening Activity 2
- **Reading:** Reading Activity 1, Reading Activity 2
- **Speaking:** Speaking Activity 1, Speaking Activity 2

Writing: Discussion essay, Review of a restaurant or cafe

Module 4(6L)

UNIT-1

Grammar: Quantifiers, Reported speech

Vocabulary: Words about buildings and sharing information

Pronunciation: Sounds */t//d//k//g//h//w/*

UNIT-2

Everyday English: Offers, request, permission; generalising and being vague

- **Listening:** Listening Activity 1, Listening Activity 2
- **Reading:** Reading Activity 1, Reading Activity 2
- **Speaking:** Speaking Activity 1, Speaking Activity 2

Writing: A note with useful information, an email summary of a news story

Module 5 (6L)

UNIT-1

Grammar: Passive, Relative clause, Second and third conditionals

Vocabulary: Words about music and sport; expressions with *do, make* and *take*

Pronunciation: -ed ending words, mostly confused words

UNIT-2

Everyday English: Recommending, Discussing problems and reassuring

- **Listening:** Listening Activity 1, Listening Activity 2
- **Reading:** Reading Activity 1, Reading Activity 2
- **Speaking:** Speaking Activity 1, Speaking Activity 2

Writing: Article, Email with advice

Text Books

1. Doff, Adrian, et al. *Empower Second Edition Student's Book with Digital Pack: B1+ Intermediate*. Cambridge University Press, 2022.

Reference Books

1. Cullen, Pauline, et al. The Official Cambridge Guide to IELTS for Academic and General Training: Student's Book with Answers. with DVD-ROM. Cambridge Univ. Press, 2014.

E-Resources

1. Cambridge English
2. English with Cambridge - YouTube
3. BBC Learning English - Learn English with BBC Learning English - Homepage
4. https://englishonline.britishcouncil.org/

Course Outcomes

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

CO1. Demonstrate a diverse vocabulary repertoire, facilitating better expression and comprehension.

CO2. Exhibit intelligible pronunciation skills, ensuring clearer oral communication.

CO3. Utilize various grammar concepts accurately and coherently.

CO4. Strengthened language skills across listening, speaking, reading, and writing.

CO5. Apply practical language skills effectively in everyday communication scenarios.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes (PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO2	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO3	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO4	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO5	-	-	-	-	-	-	-	-	2	2	-	3	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**3**	**-**	**-**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year-II Sem			
Course Code: **M120A**	**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS** (COMMON TO: CE, EEE, ME, ECE, CSE, IT, ECM, CSE(DS), CSE(AIML), AIML & AIDS)	L	T	P	C
		3	**1**	**0**	**4**

Pre-Requisites: Mathematical Knowledge at pre-university level

Module 1: First Order, First Degree ODE and its Applications [10L]

Differential equations of first order and first degree - Exact differential equation, Linear and Bernoulli differential equation, applications of differential equations of first order and first degree - Newton's law of cooling, Law of natural growth and decay, orthogonal trajectories.

Module 2: Second and Higher order ODE with Constant Coefficients: [10L]

Second order linear differential equations with constant coefficients: Solution of Homogenous, nonhomogeneous differential equations, non-Homogeneous terms of the type e^{ax}, sin(ax), cos (ax), polynomials in x^k, e^{ax} V(x), xV(x). Method of variation of parameters; Equations reducible to linear ODE with constant Coefficients: Euler-Cauchy equation, Legendre's equation

Module 3: Laplace Transforms: [10L]

Laplace transforms, Existence condition, Laplace transform of Elementary functions, Properties of Laplace transforms (Without Proofs), Laplace transform of special functions (Unit step function, Dirac delta function and Periodic function). Inverse Laplace transform and its properties, Convolution theorem (without proof) and its applications, solving linear differential equations with constant coefficients using Laplace transform.

Module 4: vector differential calculus: [9L]

Scalar and vector fields, vector differentiation, level surfaces, gradient of a scalar field, directional derivative, divergence and curl of a vector field, Scalar potential energy, Tangent plane and normal line. Vector Identities (without proofs).

Module 5: Vector integral calculus: [9L]

Line, surface and volume integrals. Green's theorem in a plane, Gauss-Divergence theorem and Stokes theorem(without proofs).

Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5 th Edition, 2019.

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002
3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

E-Resources

1. https://nptel.ac.in/courses/111108098
2. https://www.math.hkust.edu.hk/~machas/differential-equations.pdf
3. https://engineeringmath.online
4. https://www.cheric.org
5. https://www.whitman.edu/mathematics/calculus_online

Course Objectives:

To learn

1. Methods of solving the differential equations of first and higher order.
2. Concept, properties of Laplace transforms
3. Solving ordinary differential equations using Laplace transforms techniques.
4. The physical quantities involved in engineering field related to vector valued functions
5. The basic properties of vector valued functions and their applications to line, surface and volume integrals

Course Outcomes:

After learning the contents of this paper, the student must be able to

1. Identify whether the given differential equation of first order is exact or not
2. Solve higher differential equation and apply the concept of differential equation to real world problems.
3. Use the Laplace transforms techniques for solving ODE's.
4. Evaluate the line, surface and volume integrals and converting them from one to another

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes (PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year-II Sem			
Course Code: **M120D**	**ENGINEERING CHEMISTRY** (Common to CE, ME, AIML, CSM, AIDS & CSD)	L	T	P	C
		3	**1**	**0**	**4**

Pre-Requisites: Basic Knowledge

Course Objectives:

The students should be able

1. To know the suitablility of water for domestic and industrial purposes.
2. To acquire knowledge about different types of batteries and to understand the concepts of corrosion.
3. To facilitate successful pursuit of advanced degrees to support interdisciplinary ideas in engineering or other related fields
4. Gain the knowledge of chemical reactions those are used in the synthesis of molecules.

Module 1: Water and Its Treatment [11L]

Introduction – hardness of water – Causes of hardness - Types of hardness- temporary and permanent hardness – Units of hardness of water - Numerical problems – Estimation of hardness of water by complexometric method. Boiler troubles: scale and sludge, causes and effects. Potable water and Industrial water its specifications. Softening of water -Internal treatment of boiler feed water– Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process. Desalination of brackish water – Reverse osmosis. Steps involved in potable water treatment – Disinfection of water by chlorination, Breakpoint chlorination and Ozonization.

Module 2: Battery and Corrosion [12L

Batteries [7L]

Introduction– Classification of batteries - Primary (Li-MnO_2 cell) and secondary batteries (Lithium ion battery)- Applications

Fuel cells – Methanol - Oxygen fuel cell – Engineering applications

Solar cells –Principle and applications of solar cells

Corrosion[5L]

Causes and effects of corrosion–chemical and electrochemical corrosion – mechanism of electrochemical corrosion by hydrogen evolution method, types of corrosion-galvanic and waterline corrosion. Factorsinfluencing rate of corrosion - Corrosion control methods- Cathodic protection – Sacrificial anodic and impressed current cathodic methods - Hot dipping (Galvanizing and Tinning).

Module 3: Chemical Fuels [9L]

Fuels: Definition, Classification, Characteristics of a good fuel - Types of Calorific value (CV) –

Calculation of CV using Dulong's formula, Numericals.

Soild Fuels: Coal - Composition - Proximate & Ultimate Analysis - Significance.

Liquid Fuels: Gasoline and its Composition, Cracking: Fixed bed catalytic cracking method – Knocking, Anti- Knocking agents and its significance, Octane number, Cetane number.

Gaseous Fuels: Composition, characteristics and applications of natural gas, LPG and CNG

Module 4: Polymers [10L]

Polymers: Definition–Monomer, Polymer, Polymerization. Types of polymerization – addition and condensation polymerization with examples.

Plastics: Definition - thermoplastic and thermosetting plastics, compounding and fabrication of plastics (compression and injection moulding). Preparation, Properties and Engineering Applications of PVC. Urea-Formaldehyde.

Fibers: Preparation, Properties and engineering applications of Nylon-6, 6.

Conducting Polymers- Definition, Classification, Applications.

Module 5: Engineering Materials & Drugs [8L]

Nanomaterials

Introduction, Synthesis of Sol-gel method, General Applications of Nanomaterials.

Carbon Nanotubes - Properties and applications.

Portland Cement: Chemical constituents, Manufacturing of Portland cement, Setting and Hardening and applications of cement.

Drugs: Antipyretic (Paracetamol) – Medicinal Applications

Text Books

1. Engineering Chemistry: Prof. Jaya Shree Anireddy, Wiley Publications.
2. Engineering Chemistry: P. C. Jain & M. Jain, Dhanpat Rai Publications, New Delhi.
3. Engineering Chemistry: Shashi Chawla, Dhanpat Rai Publications (2019), New Delhi.

Reference Books

1. Engineering Chemistry by M. Thirumalachary and E. Laxminarayana, Scitech Publications.
2. Text Book of Engineering Chemistry by Cengage Learning, B. Rama Devi, Ch. Venkata Ramana Reddy and Prasanth Rath.
3. Engineering Chemistry (NPTEL Web-book) by B.L. Tembe, Kamaluddin and M.S.Krishnan

E-Resources

1. https://www.imnh.isu.edu/digitalatlas/hydr/basics/main/chmtxt.

2. https://chem.libretexts.org/Core/.../Electrochemistry/Basics_of_Electrochemistry
3. https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/polymers.htm
4. https://www.youtube.com/watch?v=W0-CvvAGtEM
5. https://sengerandu.wordpress.com/tutorials/physical-metallurgy/engineering-materials

Course Outcomes

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

CO1. Recognize and select the domestic and industrial problems caused by hard water and also learn about the municipal water treatment using various methods.

CO2. Understand and interpret the important fundamental concepts of electro-chemicalprocedures related to corrosion and its control.

CO3. Rate the fuels and suggest methods for enhancement of the quality of fuels for the required output.

CO4. Identify & recognize the role of polymers in everyday life.

CO5. Apply the Knowledge of engineering materials and drugs in daily life.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	-	-	-	-	3	2	-	-	-	-	3	-	-
CO2	3	-	-	-	-	3	2	-	-	-	-	3	-	-
CO3	3	2	-	-	-	3	3	-	-	-	-	3	-	-
CO4	1	2	-	-	-	3	2	-	-	-	-	2	-	-
CO5	3	-	-	-	-	2	3	-	-	-	-	1	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year-II Sem.			
Course Code: **M120C**	**ENGLISH FOR SKILL ENHANCEMENT** (Common to CE, ME, AIML, CSM, AIDS & CSD)	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: NIL

Course Objectives:

The students should be able

1. Enhancing understanding of key concepts related to language structures and language usage.
2. Ensuring the ability to write grammatically correct and diverse sentences, free from punctuation and spelling errors.
3. Improving students' proficiency in English required for technical education.
4. Building academic competence and confidence to use language effectively.
5. Developing life skills to tackle different challenges.

Module 1 **(10L)**

Lesson: 'Toasted English' by R. K. Narayan

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

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

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

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

Module 2 **(9L)**

Lesson: 'Appro JRD' by Sudha Murthy

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

Module 3 **(8L)**

Lesson: Elon Musk

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

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

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice.

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

Module 4 **(8L)**

Lesson: Art and Literature by Dr. Abdul Kalam

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

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

Writing: Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.

Module 5 **(8L)**

Lesson: Go, Kiss the World' by Subroto Bagchi

Vocabulary: Technical Vocabulary and their Usage

Grammar: Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

Reading: Reading Comprehension-Exercises for Practice

Writing: Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

Text Books

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

Reference Books

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006). Study Writing. Cambridge University Press.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

E-Resources

1. https://sharmadkm.wordpress.com/2022/12/11/toasted-english-by-r-k-narayan/
2. https://sharmadkm.wordpress.com/2022/12/20/apro-jrd-summary/
3. Cambridge English
4. BBC Learning English - Learn English with BBC Learning English - Homepage

Course Outcomes

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

CO1. Expand their vocabulary through mastery of word roots, prefixes, and suffixes.

CO2. Demonstrate proficiency in grammar fundamentals, including sentence structure and parts of speech.

CO3. Exhibit competence in reading and writing skills for effective communication in diverse contexts.

CO4. Apply critical thinking and analytical skills to analyse texts and synthesize information.

CO5. Express themselves confidently and coherently through oral presentations, discussions, and written compositions.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes (PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO2	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO3	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO4	-	-	-	-	-	-	-	-	2	2	-	3	-	-
CO5	-	-	-	-	-	-	-	-	2	2	-	3	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**3**	**-**	**-**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year –II Sem			
Course Code: **M123A**	**ENGINEERING MECHANICS** (COMMON TO: ME, CE)	L	T	P	C
		4	**0**	**0**	**4**

Pre-Requisites: Engineering Physics.

Module 1: Resultant Force system and Equilibrium of Force System

Unit-I:

System of forces: Introduction to Engineering Mechanics, Basic Definitions, Fundamental Laws of Mechanics, Resolution and Resultant of Coplanar Concurrent Forces(2D), Moment of Force (Non Concurrent and Non parallel Forces in Coplanar (2D) System).

Unit-II:

Equilibrium of System of Forces: Introduction, Equation of Equilibrium, Free Body Diagram(FBD), Lami's Theorem.

Module 2: Analysis of Trusses and Friction

Unit-I:

Analysis of Structures: Types of Trusses, Analysis of perfect trusses using method of joints and method of sections.

Unit-II:

Friction: Introduction, Types of Friction, Explanation for the Development of Friction, Limiting Friction and Impending Friction, Definitions, Coulomb's Laws of Friction, Equations of Equilibrium in a Friction.

Module 3: Centroid & Centre of Gravity and Area moment of Inertia

Unit-I:

Centroid & Centre of Gravity: Introduction, Definitions of Centroid & Centre of Gravity, Difference between Centroid and Centre of Gravity, Centroids of some Standard Figures (such as Circle, Rectangle, Square, etc…), Centroids of simple Figures (such as I, H, rectangular, T and circular sections, etc..), Centroid of Composite Figures, Centre of gravity of Standard Solid Bodies (such as Cylinder, Sphere, Cone, etc…), Centre of gravity of simple Bodies(such as Hemisphere, Cylinder, Sphere, Cone, etc…), Centre of gravity of Composite Bodies, Pappu's theorem.

Unit-II:

Area moment of Inertia: Definition of Area moment of Inertia, Polar Moment of inertia, Perpendicular Axis Theorem, Transfer Theorem for Area Moment of Inertia (Parallel Axis Theorem), Area Moment of Inertia of Standard Figures, about the Centroidal Axes, Area Moment of Inertia, Area Moment of Inertia of Composite Figures.

Module 4: Kinematics and Kinetics

Unit-I:

Kinematics: Introduction, Types of Motion, Rectilinear Motion, Curvilinear motion (Projectile), Rotatory Motion.

Unit-II:

Kinetics: Introduction, Rectilinear Motion- D'Alemberts Principle, Rotatory Motion-Fixed Axis Rotation.

Module 5: Work Energy Method and Mechanical Vibrations

Unit-I:

Work Energy Method: Introduction, Work-Energy Equation for Translation, Work-Energy Equation for Fixed axis rotation and Work-Energy Equation for plane motion.

Unit-II:

Mechanical Vibrations: Introduction to Mechanical vibration, Definitions, simple harmonic motion, Free Vibration (without Damping), Pendulum Motion.

Text Books

1. Dr. T. Vijaya Krishna, Dr. T. Madhu Mohan, "Engineering Mechanics", CENGAGE Learning India Pvt. Ltd., 2017.
2. Vijaykumar K. and J. Suresh Kumar, "Engineering Mechanics Statics and Dynamics", B. S. Publications. 2011.
3. Timoshenko & Young, "Engineering Mechanics", SI Publications, 2010.

Reference Books

1. Basudev Bhattacharya, "Engineering Mechanics", Oxford University Press, 2nd Edt, 2014
2. S.S. Bhavikatti & J.G. Rajasekharappa, "Engineering Mechanics", 2010.
3. Irving. H. Shames, "Engineering Mechanics", Prentice–Hall, 2012.

E-Resources

1. https://rb.gy/6nbwyl
2. https://rb.gy/s5qltu
3. https://nptel.ac.in/courses/122/104/122104015/

Course Outcomes

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

CO1. Solve problems dealing with forces in plane force system, draw free body diagrams to analyze various problems in equilibrium.

CO2. Analyze for smooth and frictional surface, simple trusses for forces.

CO3. Determine the Centroid, center of gravity and moment of inertia for elementary.

CO4. Solve problem in kinematics and kinetics of particles and rigid bodies.

CO5. Analyze body motion using work energy principles and able to apply the concept of simple harmonic motion and free vibrations in dynamics.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	2	2	-	-	-	-	-	-	-	3	1	-
CO2	3	2	2	2	-	-	-	-	-	-	-	3	2	-
CO3	3	2	2	2	-	-	-	-	-	-	-	3	2	-
CO4	3	2	1	3	-	-	-	-	-	-	-	3	2	-
CO5	3	2	1	3	-	-	-	-	-	-	-	3	2	-
Average	3	2	1.6	2.4	-	-	-	-	-	-	-	3	1.8	-

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year – II SEM			
Course Code: **M1232**	**COMPUTER AIDED ENGINEERING GRAPHICS** (Common to CE, ME)	L	T	P	C
		1	**0**	**3**	**2.5**

Pre-Requisites: Engineering Mathematics.

Module 1: Principles of Engineering Drawing, Conic Sections, Curves, Scales [12L]

Unit-I: [3L] Introduction to Engineering Graphics: Principles of Engineering Graphics and their Significance. Construction of Plane, Diagonal Scales.

Unit-II: [6L] Conic Sections including the Rectangular Hyperbola – General method only, Cycloid, Epicycloid and Hypocycloid.

Unit-III: [3L] Introduction to Computer aided drafting – views, commands and conics.

Module 2: Orthographic Projections [12L]

Unit-I: [3L] Principles of Orthographic Projections – Conventions.

Unit-II: [3L] Projections of Points and Lines, Projections of Plane regular geometric figures – Circle, Square, Rectangle, Triangle, Pentagon, Hexagon.

Unit-III: [6L] Computer aided orthographic projections – points, lines and planes.

Module 3: Projections of Solids [12L]

Unit-I: [6L] Projections of Right Regular Solids – Prisms and Pyramids of Square, Pentagon, Hexagon;

Unit-II: [6L] Projections of Generated Solids – Cone, Cylinder. Computer aided projections of solids.

Module 4: Sections of Solids, Development of Surfaces of Solids [12L]

Unit-I: [3L] Sectional View of Right Regular Solids – Prisms and Pyramids of Pentagon, Hexagon; Generated solids – Cylinder and Cone.

Unit-II: [6L] Development of Surfaces of Right Regular solids – Prism, cylinder pyramid and cone.

Unit-III: [3L] Computer aided sectional views, Development of surfaces.

Module 5: Isometric Projections, Orthographic Views [12L]

Unit-I: [9L] Principles of Isometric Projections, Isometric Scale, Isometric Views of Simple and Compound Solids; Conversion of Orthographic Views of simple objects to Isometric Views and Vice-versa.

Unit-II: [3L] Conversion of orthographic projection into isometric view using computer aided drafting.

Text Books

1. Bhatt N.D., Panchal V.M. & Ingle P.R., "Engineering Drawing", Charotar Publishing 2014.
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S. Chand and company Ltd.
3. K. Venugopal & V. Prabhu Raja, "Engineering Drawing + Auto CAD", New Age International Publishers. Fifth Edition, 2011.

Reference Books

1. Narayana, K.L. & P Kannaiah, "Text book on Engineering Drawing", Scitech Publish, 2008
2. Agrawal B. & Agrawal C. M., "Engineering Graphics", TMH Publn, 2012.

E-Resources

1. https://nptel.ac.in/courses/112/103/112103019/
2. https://urlzs.com/fLJ3T
3. https://urlzs.com/zky46

Course Outcomes

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

CO1. Apply computer aided drafting tools to create 2D and 3D objects

CO2. Sketch conics and different types of solids

CO3. Appreciate the need of Sectional views of solids and Development of surfaces of solids

CO4. Read and interpret engineering drawings

CO5. Conversion of orthographic projection into isometric view and vice versa manually and by using computer aided drafting

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**
CO1	3	3	2	1	2	-	-	-	-	-	-	3	1	1
CO2	3	3	2	1	2	-	-	-	-	-	-	3	2	1
CO3	3	3	2	1	2	-	-	-	-	-	-	3	2	1
CO4	3	3	3	1	2	-	-	-	-	-	-	3	2	2
CO5	3	3	3	1	2	-	-	-	-	-	-	3	2	3
Average	3	3	2.4	1	2	-	-	-	-	-	-	3	1.8	1.6

Correlation: 3–Strong; 2–Medium; 1-Weak

Note: - Internal evaluation must be done in both conventional as well as using Computer Aided Drafting.

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year-II Sem.			
Course Code: **M1203**	**ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB** (Common to CE, ME, AIML, CSM, AIDS & CSD)	L	T	P	C
		0	**0**	**3**	**1**

Pre-Requisites: NIL

COURSE OBJECTIVES: To train students:

1. To use accurate and appropriate pronunciation through the practice of phonetic sounds, symbols, word accent and into nation.
2. To improve their fluency in spoken English and neutralize their mother tongue influence through JAM Sessions, Role-play, etc.
3. To comprehend the speech of people of various regions through Listening practice exercises. To enable students to transfer information verbally with the right usage of Body language through individual and group activities.
4. To understand nuances of English language by practicing various exercises at Multi-media lab.

English Language and Communication Sills Lab (ELCS) will have two divisions:

a) **Computer Assisted Language Learning Lab (CALL)**

b) **Interactive Communication Skills Lab (ICS)**

Module 1: (9L)

CALL Lab:

General Indian English (GIE) and Interference of Mother Tongue (MTI) -Differences in British and American Pronunciation.

Introduction to Phonetics – Speech Sounds – Vowels and Consonants; Minimal Pairs

ICS Lab:

Ice-Breaking Activity and JAM Session- Situational Dialogues -Greetings-Taking Leave - Introducing Oneself and Others.

Module 2: (9L)

CALL Lab:

The Phoneme: The Syllable.

ICS Lab: Features of Good Conversation - Non-verbal Communication- Telephone Etiquette-Role Plays.

Module 3: (9L)

CALL Lab:

Stress-Word and Sentence Stress- Stress Shift- Strong and Weak Forms.

ICS Lab:

Introduction to a structured talk, Presentations Skills-Formal Presentations.

Module 4: **(9L)**

CALL Lab:

Intonation-Errors in Pronunciation- Neutralizing MTI

ICS Lab: Introduction to Group Discussion - Mock GD.

Module 5: **(9L)**

CALL Lab: Listening for Specific Details-Listening Comprehension Tests.

ICS Lab: Introduction to Interview Skills-Mock Interviews.

Text Books

1. ELCS Lab Manual: A Workbook for CALL & ICS Lab Activities; Orient Black Swan.

Reference Books

1. Balasubramanian. T (2009), A Textbook of English Phonetics for Indian Students. Macmillan.
2. Bansal. R.K, Harrison J.B. (2008). Spoken English. Orient Black Swan.
3. Ashraf Rizvi M (2010). Effective Technical Communication. McGraw-Hill.

E-Resources

1. https://bbamantra.com/listening/
2. https://en.wikipedia.org/wiki/Phonetics#:~:text=Phonetics%20is%20a%20branch%20of,the%20physical%20properties%20of%20speech.
3. https://www.innovativeteachingideas.com/blog/10-great-activities-to-break-the-ice-with- your-students
4. http://kjtenglishnotes.blogspot.com/2015/10/how-i-became-public-speaker.htmlhttps://www.learngrammar.net/english-grammar

Course Outcomes

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

Neutralize the Mother tongue influence in day to communication

CO1. Differentiate the speech sounds in English and demonstrate accurate pronunciation

CO2. Comprehend and respond to the given texts appropriately.

CO3. Improve their effective and empathetic listening ability

CO4. Communicate confidently and effectively in various contexts and different cultures.

CO5. Listen actively, speak fluently and write accurately

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes (PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	**3**	**3**	-	**2**	-	-
CO2	-	-	-	-	-	-	-	-	**3**	3	-	**2**	-	-
CO3	-	-	-	-	-	-	-	-	**3**	3	-	**2**	-	-
CO4	-	-	-	-	-	-	-	-	3	3	-	**2**	-	-
CO5	-	-	-	-	-	-	-	-	**3**	3	-	**2**	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**3**	**-**	**2**	**-**	**-**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year-II Sem			
Course Code: **M1202**	**CHEMISTRY LABORATORY** (Common to CE, ME, AIML, CSM, AIDS & CSD)	L	T	P	C
		0	**0**	**2**	**1**

Pre-Requisites:

List of experiments (Any 10-12 experiments)

Volumetric Analysis:

1. Preparation of standard solution of oxalic acid and standardisation of NaOH.
2. Determination of total hardness of water by complexometric method using EDTA.
3. Determination of chloride content of water by Argentometry.
4. Estimation of Ferrous ion in Mohr's salt using Permanganomerty.
5. Estimation of ferrous ion in Mohr's salt by dichrometry.

Determination of Physico-Chemical Properties:

6. Determination of viscosity of a given liquid by using Ostwald's viscometer.
7. Determination of surface tension of a given liquid using stalagmometer.
8. Determination of partition coefficient of acetic acid between n-butanol and water.

Instrumental methods of Analysis:

9. Estimation of strength of HCl by Conductometric titrations using NaOH.
10. Estimation of strength of HCl by Potentiometric titrations using NaOH.
11. Estimation of Cu^{+2} in a given sample by colorimetry.
12. Estimation of Mn^{+2} in given sample by colorimetry.

Synthesis of Nanomaterials, Polymers and drug molecules:

13. Synthesis of Iron Nanoparticles
14. Synthesis of Polymer-Bakelite.
15. Synthesis of drug molecule Aspirin.

Text Books

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg, (R. Chand & Co., Delhi)
2. An introduction to practical chemistry, K.K. Sharma & D.S. Sharma, (Vikas publishing, N. Delhi)
3. "Text book of practical organic chemistry", Vogel's ,5th edition.
4. "Text book on Experiments and calculations in engineering chemistry", S.S. Dara

Course Outcomes

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

1. Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
2. Calculate the concentration and amount of various substances using instrumental techniques.
3. Synthesize the engineering materials like nanomaterials, polymers and drug molecules.

4. Determine the physic-chemical properties like partition co-efficient, surface tension and viscosity.
5. Determine the partition coefficient of organic compound in two immiscible liquids.

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME I Year – II SEM			
Course Code: **M12AC2**	**HUMAN VALUES AND PROFESSIONAL ETHICS** (Common to CE, ME, AIML, CSM, AIDS & CSD)	L	T	P	C
		2	**0**	**0**	**0**

Pre-Requisites: Positive bent of mind, Zeal to know the essence of human existence and Nature.

COURSE OBJECTIVES:

1. To enable students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of existence. Such a holistic perspective forms the basis of Value based living in a natural way.
3. To highlight plausible implications of the above Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.

Module I:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Module II:

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

Module III:

Understanding Harmony in the Family and Society- Harmony in Human - Human Relationship : Understanding harmony in the Family- the basic unit of human interaction.

Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family!

Module IV:

Understanding Harmony in the Nature and Existence - Whole existence as Co- existence: Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self- regulation in nature. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

Module 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:

Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly andeco- friendly production systems,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: At the level of individual: as socially and ecologically responsible engineers, technologists and managers At the level of society: as mutually enriching institutions and organizations.

TEXT BOOKS

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. KV Subba Raju, 2013, Success Secrets for EngineeringStudents, Smart Student Publications,3rd Edition.

AY: 2025-26 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year-I Sem			
Course Code: **M210A**	**PROBABILITY AND STATISTICS** (COMMON TO:CE,ME, CSE, IT,ECM, CSE(AIML), CSE(DS), AIDS, CSE(AIML), AIML)	L	T	P	C
		3	**1**	**0**	**4**

Pre-Requisites: Mathematical Knowledge at the pre-university level

Module 1: Single Random Variables: [12L]

Introduction to Probability, Random Variables, Discrete and Continuous, Probability distributions, mass function/ density function of a probability distribution, mathematical expectation, moments about the origin, central moments.

Module 2: Probability Distributions: [12L]

Binomial, Poisson, Normal, and Exponential distributions and their properties moment generating functions of the above distributions and hence finds the mean and variance.

Module 3: Sampling and Testing of Hypothesis for Large Samples: [15L]

Sampling: Definition of population, sampling, statistic, parameter, Types of sampling, sample mean and Variance, sampling distribution, standard error, sampling distributions of means and variance.

Testing of Hypothesis: Null and Alternative hypothesis, Type I and Type II errors, Critical region, confidence interval, Level of significance, One tailed and Two tailed test.

Large sample tests: Test of hypothesis for single mean and difference between the means, Test of hypothesis for single proportion and difference between the proportions, Tests of significance of difference between sample S.D and population S.D.

Module 4: Testing of Hypothesis for Small Samples: [9L]

Test of significance-t distribution, paired t-test, confidence interval for the t- distribution, test for ratio of variances (F-test), Chi- square test for goodness of fit and independence of attributes.

Module 5: Correlation and Regression: [9L]

Correlation: Types of correlation, Coefficient of correlation, the rank correlation, Covariance of two random variables.

Regression: Regression Coefficient, the lines of Regression.

Text Books

1. S.C Gupta and V.K. Kapoor: Fundamentals of Mathematical Science, 2006.
2. Sheldon M.Ross: Introduction to Probability and Statistics for Engineers and Scientists.

Reference Books

1. R.A Johnson: Miller and Freund's Probability and Statistics for Engineers, Pearson Publishers, 9th Edition, 2017.
2. B.S.Grewal: Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
3. John E. Freund, Benjamin M. Perles: Modern elementary statistics, Pearson, 2014.

Course Objectives:

- To learn elementary ideas in basic probability.
- To learn different types of probability distribution functions.
- To learn various methods to test the hypothesis.
- To learn methods of calculating correlation and regression.

Course Outcomes:

After completion of the course, the student should be able to

CO-1: Solve problems involving basic probability.

CO-2: Evaluate statistical parameters of probability distributions.

CO-3: Assess the importance of sampling distribution of a given statistic of a random sample.

CO-4: Apply the knowledge of different probability distributions to Test of Hypothesis.

CO-5: Calculate correlation, regression, rank correlation coefficients.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes(PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	2	3	1	1	1			-	-	-	-	1	2	1
CO2	2	3	2	2	2			-	-	-	-	1	2	1
CO3	2	3	1	1	-			-	-	-	-	1	1	1
CO4	2	3	2	2	2			-	-	-	-	1	1	1
CO5	2	3	2	2	-			-	-	-	-	1	2	1
Average	**2**	**3**	**1.6**	**1.6**	**1.6**	-	-	-	-	-	-	**1**	**1.6**	**1**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - I Sem			
Course Code: **M213A**	**METALLURGY AND MATERIAL SCIENCE**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Engineering Chemistry, Engineering Physics.

Module 1: Introduction to Metallurgy [10L]

Unit-I: [6L]
Introduction: Classification of ores. principles of pyrometallurgy, principles of hydrometallurgy
Unit-II: [4L]
principles of electrometallurgy, Smelting furnaces: Blast Furnace

Module 2: Structure of Metals, Constitution of Alloys [10L]

Unit-I: [5L]
Grains and Grain Boundaries. Effect of grain size on the properties. Determination of grain size by different methods.

Unit-II: [5L]
Necessity of alloying, Types of solid solutions, Hume - Rothery rules, Intermediate alloy phases.

Module 3: Steel Phase Diagrams [9L]

Unit-I: [5L]
Phase rule, Lever rule, Binary phase Diagrams, iso-morphous, Eutectic and Eutectoid transformations with examples.

Unit-II: [4L]
STEELS: Iron-Carbon Phase Diagram and Heat Treatment: Study of Fe-Fe3C phase diagram, Annealing, Normalizing, Hardening and Tempering of steels.

Module 4: Cast Iron and Non- ferrous metals and alloys [8L]

Unit-I: [5L]
CAST IRONS: Structure and properties of White Cast iron, Malleable Cast iron, Grey cast iron.

Unit-II: [3L]
Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

Module 5: Smart Materials, Shape Memory Alloys [10L]

Unit-I: [5L]
Introduction to Smart Materials, Principles of Piezoelectricty, Principles of Magnetostriction, Rare earth Magnetostrictive materials, Giant Magnetostriction and Magneto-resistance Effect, Shape Memory Effect.

Unit-II: [5L]
Shape Memory Polymers, Electro-rheological Fluids, Magneto Rhelological Fluids.

Text Books

1. Sidney H. Avner, "Introduction to Physical Metallurgy", S. Chand Publications, 2nd Edition, 1997.
2. Kodgire, "Material Science and Metallurgy for Engineers", Everest Publications, 14th Edition, 2003.
3. Donald R. Askeland, Wendelin J. Wright, "Fundamentals of Smart Materials", Cengage Learning, 3rd Edition, 2013.

Reference Books

1. William and callister, "Materials Science and Engineering".
2. Er. Amandeep Singh Wadhva, "Engineering Material and Metallurgy"

E-Resources

1. https://shorturl.at/uOdqL

Course Outcomes

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

CO1: Classify various ores and explain the principles of pyrometallurgy, hydrometallurgy, and electrometallurgy.
CO2. Analyze the effects of grain size on the properties of metals and determine grain size using different methods.
CO3. Apply the phase rule and lever rule to interpret binary phase diagrams, including isomorphous, eutectic, and eutectoid transformations.
CO4. Compare the structures and properties of various cast irons, including white, malleable, and grey cast iron.
CO5. Explain the principles of smart materials, including piezoelectricity, magnetostriction, and the shape memory effect.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	1	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	2	3	-	-	-	-	-	-	-	2	-
CO3	3	2	1	1	1	-	-	-	-	-	-	-	-	-
CO4	3	2	1	1	1	-	-	-	-	-	-	-	-	1
CO5	3	1	1	1	3	-	-	-	-	-	-	-	1	1
Average	3	2.2	1.2	1.6	2	-	-	-	-	-	-	-	1.5	1

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - I Sem			
Course Code: **M213B**	**MECHANICS OF SOLIDS**	L	T	P	C
		3	**1**	**0**	**4**

Pre-Requisites: Engineering Physics, Engineering Mechanics

Module 1: Stresses & Strains [10L]

Definitions, types of stresses and strains, elasticity and plasticity. Hooke's law, stress-strain diagrams for engineering materials, modulus of elasticity. Poisson's ratio, relationship between elastic constants, linear and volumetric strains, bars of uniform strength, temperature stresses, and composite bars.

Module 2: Shear Force and Bending Moment diagrams [9L]

Definition of bending moment and shear force; relationship between intensity of loading, shear force and bending moment; bending moment and shear force diagrams for cantilever, simply supported and overhanging beams; simple theory of bending, moment of resistance, modulus of section.

Module 3: Flexural stresses, Shear Stresses [8L]

Unit-I: [4L]

Theory of simple bending –Assumptions–Derivation of bending equation, Determination bending stresses –Section modulus of rectangular and circular (Solid and Hollow) sections.

Unit-II: [4L]

Distribution of shear stresses in rectangular, I-section, T- section, solid and hollow circular sections.

Module 4: Deflection of Beams, Torsion [10L]

Unit-I: [5L]

Deflections of cantilever and simply supported beams including overhanging for point loads, U.D.L by double integration and Macaulay's method. Strain energy in bars due to gradually applied loads, impact loads and shock loads.

Unit-II: [5L]

Theory of pure torsion – Derivation of Torsion equations – 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. Springs - Axial load-helical springs - stresses and deformations - strain energy- leaf springs.

Module 5: Principal Stresses and Strains, Thin and Thick Cylinders [10L]

Unit-I: [5L]

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 – theories of failures -Dilation - Distortion - Maximum Principal Stress Theory - Maximum Principal Strain Theory - Maximum Shear Stress Theory - Strain Energy Theory – Distortion energy theory.

Unit-II: [5L]

Thin seamless cylindrical shells, Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in diameter, and volume of thin cylinders– Thin spherical shells. Thick Cylinders- Lami's equations, Compound cylinders.

Text Books

1. **R. K. Bansal**, "A Textbook of Strength of Materials", Laxmi Publications, 6th Edition, 2022.
2. **R. C. Hibbeler**, "Mechanics of Materials", Pearson Education, 10th Edition, 2022.

Reference Books

1. **Timoshenko and Gere**, "Mechanics of Materials", CBS Publishers, 4th Edition, 2002.
2. **Ferdinand P. Beer, E. Russell Johnston Jr., John T. Dewolf**, "Mechanics of Materials", McGraw-Hill Education, 7th Edition, 2015.

E-Resources

1. https://shorturl.at/1QrKY

Course Outcomes

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

CO1: Understand and apply the fundamental concepts of stress, strain, and deformation in materials under various loading conditions.
CO2: Analyze and determine the shear force and bending moment in beams subjected to different types of loads.
CO3: Calculate and interpret the deflection and slope of beams using appropriate methods.
CO4: Evaluate the stresses and deformations in shafts and springs under torsional loads.
CO5: Assess the principal stresses and strains in structural members and apply failure theories to predict material behavior under complex loading conditions.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	1	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	2	3	-	-	-	-	-	-	-	2	-
CO3	3	2	1	1	1	-	-	-	-	-	-	-	-	-
CO4	3	2	1	1	1	-	-	-	-	-	-	-	-	1
CO5	3	1	1	1	3	-	-	-	-	-	-	-	1	1
Average	3	2.2	1.2	1.6	2	-	-	-	-	-	-	-	1.5	1

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - I Sem			
Course Code: **M213C**	**PRODUCTION TECHNOLOGY**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Engineering Physics, Engineering Materials.

Module 1: Casting, Methods of Melting [10L]

Unit I: Steps involved in making a casting – Advantage of casting and its applications – Patterns and Pattern making – Types of patterns – Materials used for patterns – pattern allowances and their construction – Principles of Gating – Gating ratio and design of Gating systems. Risers – Types function and design; casting design considerations – special casting processes – Centrifugal casting, Die casting, Investment casting; Solidification of pure metals and alloys.

Unit II: Crucible melting and cupola operation.

Module 2: Welding, Cutting of Metals [9L]

Unit I: Classification of welding processes, types of welds and welded joints – their characteristics, Gas welding, Arc welding, Forge welding, resistance welding, Thermit welding and Plasma (Air and water) welding. Inert Gas welding – TIG and MIG welding, Friction welding, Induction welding, Explosive welding, Laser welding, Soldering and Brazing;

Unit II: Heat affected zones in welding – welding defects – causes and remedies; destructive and non-destructive testing of welds. Principles of Powder Metallurgy.

Module 3: Hot and cold working, Extrusion of Metals [8L]

Unit I: Hot working – cold working – strain hardening – Comparison of properties of Cold and Hot worked parts. Rolling fundamentals – theory of rolling – types of Rolling mills and products – Forces in rolling and power requirements.

Unit II: Basic extrusion process and its characteristics – Hot and cold extrusion, Forward and backward extrusion, Impact extrusion, Hydrostatic extrusion.

Module 4: Forging processes, Stamping, forming and cold working processes [10L]

Unit I: Forging processes: Principles of forging – Tools and dies – Types of Forging – Smith forging, Drop Forging, Rotary forging, Roll forging – Forging hammers – forging defects.

Unit II: Stamping, forming and other cold working processes: Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing, coining, Hot and cold spinning – Types of presses and press tools. Forces and power requirement in the above operations

Module 5: Polymers, Processing of Plastics [10L]

Unit-I: Introduction – Processing techniques of Polymers

Unit-II: Types of Plastics – Properties – applications and their Processing methods and Equipment – blow & injection moulding.

Text Books

1. P.N. Rao, "Manufacturing Technology", Tata McGraw Hill, 2nd Edition, 2000.
2. H. S. Shan, Manufacturing Processes: Casting, Forming and Welding, Cambridge University Press.
3. Kalpak jian and Steven R Schmid, "Manufacturing Processes for Engineering Materials", Pearson Publishers Donald

Reference Books

1. R. S. Parmar, Welding Engineering and Technology, Khanna Publishers.
2. Marsha P C, "Production Technology", S. Chand Publications, 6th Edition, 2006.
3. S. Kalpakjian & S. R. Schmid, Manufacturing Engineering and Technology, Pearson.

E-Resources

1. https://shorturl.at/2AKMh
2. https://shorturl.at/UVNAM

Course Outcomes

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

CO1 : Understand the fundamentals of casting processes, including pattern making, gating systems, and solidification of metals and alloys.

CO2 : Analyze various welding processes, their applications, and associated defects, and understand the principles of cutting metals.

CO3 : Comprehend the principles of hot and cold working processes, including rolling and extrusion, and their effects on material properties.

CO4 : Evaluate forging processes and understand stamping, forming, and other cold working operations, including their power requirements.

CO5 : Gain knowledge about polymers, their properties, and processing techniques, including blow and injection molding.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	1	2	-	-	-	-	-	-	2	2	-
CO2	2	3	2	1	2	-	-	-	-	-	-	2	2	-
CO3	2	1	2	1	1	-	-	-	-	-	-	2	1	-
CO4	2	3	2	1	1	-	-	-	-	-	-	2	1	-
CO5	2	2	2	1	1	-	-	-	-	-	-	2	-	-
Average	2.2	2.4	2.2	1	1.4	-	-	-	-	-	-	2	1.5	-

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - I Sem			
Course Code: **M213D**	**THERMODYNAMICS**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Engineering Physics, Engineering Materials.

Module 1: Basic Concepts [8L]

System – Control Volume – Surrounding – Boundaries and 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 Work and other forms of work – Heat, Point and Path functions. Various Non -flow processes – Heat and Work Transfer – Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Constant Volume gas Thermometer – Scales of Temperature – Ideal Gas Scale – Joule's Experiments.

Module 2: Thermodynamic Laws [10L]

First law of Thermodynamics – Corollaries – First law applied to a Process and 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 – I & II. Carnot's principle, Carnot cycle and its specialties. Clausius Inequality – Entropy, Principle of Entropy Increase. Energy Equation – Availability and Irreversibility – Thermodynamic Potentials – Gibbs and Helmholtz Functions – Maxwell Relations.

Module 3: Gas Laws and Mollier Charts [8L]

Perfect Gas Laws – Equation of State – Specific and Universal Gas constants. Changes in Internal Energy. Throttling and Free Expansion Processes, Flow processes. Deviations from perfect Gas Model – Vander Waal"s Equation of State – Compressibility charts – variable specific Heats – Gas Tables-Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation. Third Law of Thermodynamics. Property tables. Mollier charts – Steam Calorimetry.

Module 4: Psychrometric Properties [10L]

Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction, Volume fraction and partial pressure, Equivalent Gas constant and Molecular Internal Energy, Enthalpy, 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.

Module 5: Thermodynamic Cycles [10L]

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

Text Books

1. PK Nag, "Engineering Thermodynamics", Tata McGraw Hill, 2013.
2. Ethirajan Ratha Krishnan, "Engineering Thermodynamics", PHI, 2006.

Reference Books

1. DP Mishra, Cengage Learning, "Engineering Thermodynamics", 2nd Impression, 2012.
2. Yunus A. Cengel, Michael A. Boles, "Thermodynamics an Engineering Approach", Tata McGraw Hill, 8th Edition, 2015.
3. J.P.Holman, "Thermodynamics", Tata McGraw Hill,4th Edition.

E-Resources

1. https://shorturl.at/QOwpM

Course Outcomes

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

CO1 : Understand and apply the fundamental concepts of thermodynamics, including system types, properties, processes, and the concept of continuum.

CO2 : Analyze and solve problems related to heat and work interactions, applying the first and second laws of thermodynamics to closed and open systems.

CO3 : Utilize thermodynamic property tables, Mollier charts, and equations of state to evaluate the behavior of pure substances and ideal gases.

CO4 : Interpret and analyze psychrometric properties and processes involving mixtures of gases and vapors.

CO5 : Evaluate and compare various thermodynamic cycles, including power and refrigeration cycles, and assess their performance using appropriate thermodynamic principles.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	-	-	-	-	-	-	-	-	-	2	1	-
CO2	3	2	2	2	2	-	-	-	-	-	-	2	2	-
CO3	2	3	2	2	2	-	-	-	-	-	-	3	2	1
CO4	3	3	2	3	2	-	-	-	-	-	-	3	2	2
CO5	3	2	3	2	2	-	-	-	-	-	-	3	1	2
Average	2.8	2.2	2.3	2.8	2	-	-	-	-	-	-	2.6	1.6	1.7

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - I Sem			
Course Code: **M2131**	**MATERIAL SCIENCE AND MECHANICS OF SOLIDS LAB**	L	T	P	C
		0	**0**	**2**	**1**

Pre-Requisites: Engineering Materials, Mechanics of Solids

List of Experiments

1. Preparation and study of the micro-Structure of pure metals such as Fe, Cu and Al.
2. Preparation and study of the micro-structure of Mild steel, Low carbon Steel and High carbon Steel
3. Study of the Micro Structures of Cast Irons.
4. Study of the Micro Structures of Copper Alloys.
5. Study of the Micro Structures of Aluminum Alloys.
6. Tensile test on UTM.
7. Impact test.
8. Hardness test.
9. Torsion test.
10. Deflection test on beams

Course Outcomes

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

CO1 : Prepare metallographic specimens and analyze the microstructures of various metals and alloys, including pure metals (Fe, Cu, Al), mild steel, low carbon steel, high carbon steel, cast irons, copper alloys, and aluminum alloys.
CO2 : Perform mechanical testing on materials using Universal Testing Machines (UTM) to determine tensile properties, and assess impact toughness, hardness, torsional strength, and deflection characteristics.
CO3 : Interpret experimental data to correlate microstructural features with mechanical properties, enhancing the understanding of material performance.
CO4 : Develop technical skills in operating laboratory equipment, preparing specimens, and conducting experiments safely and accurately.
CO5 : Demonstrate effective communication skills through the preparation of comprehensive laboratory reports and presentations, reflecting on experimental procedures and outcomes.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	3	2	-	2	1	1
CO2	-	-	-	-	-	-	-	-	3	2	-	2	1	1
CO3	-	-	-	-	-	-	-	-	3	2	-	2	1	1
CO4	-	-	-	-	-	-	-	-	3	2	-	1	1	1
CO5	-	-	-	-	-	-	-	-	3	2	-	1	1	1
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**	**2**	**-**	**1.6**	**1**	**1**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - I Sem			
Course Code: **M2132**	**PRODUCTION TECHNOLOGY LAB**	L	T	P	C
		0	**0**	**2**	**1**

Pre-Requisites: Engineering Physics, Engineering Materials.

List of Experiments

1. To prepare a pattern using Wood Turning Lathe machine.
2. To prepare a mould cavity and casting.
3. To prepare a Journal bearing by Casting Process.
4. To prepare a Lap and Square butt joint joint using Arc welding
5. To prepare a Butt joint using Gas welding.
6. To prepare a Lap joint using Spot Welding.
7. To prepare a butt joint using TIG Welding.
8. To join two sheets by Brazing process.
9. To cut MS plates using Plasma Welding/ Cutting Machine.
10. Study of Simple Die, Compound die and progressive dies.
11. To make a cup using hydraulic press.
12. To prepare a plastic product using injection moulding machine.

Course Outcomes

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

CO1 : Design and fabricate wooden patterns using carpentry tools, and prepare sand moulds for casting various components.
CO2 : Demonstrate proficiency in various welding techniques, including Arc, Gas, TIG, and Spot welding, to join metal pieces effectively.
CO3 : Utilize casting processes to produce components such as journal bearings and other metal parts, understanding the principles of moulding and solidification.
CO4 : Operate advanced manufacturing equipment, including plasma cutting machines, hydraulic presses, and injection moulding machines, to produce precise components.
CO5 : Apply knowledge of die types—simple, compound, and progressive—to design and analyze die operations, enhancing the understanding of sheet metal forming processes.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	-	-	-	-	-	2	-	-	2	2	-
CO2	1	1	2	-	-	-	-	-	2	-	-	1	2	1
CO3	1	1	-	-	-	-	-	-	1	-	-	-	2	-
CO4	1	1	-	-	-	-	-	-	2	-	-	1	2	-
CO5	1.5	1.2	0.7	-	-	-	-	-	1.7	-	-	1	2	1
Average	**1.5**	**1.24**	**1.23**	**-**	**-**	**-**	**-**	**-**	**3**		**-**	**1.6**	**2**	**1**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - I Sem			
Course Code: **M2134**	**COMPUTER AIDED MACHINE DRAWING LAB**	L	T	P	C
		0	**0**	**2**	**1**

Pre-Requisites: Engineering Drawing.

Module 1: Machine Drawing Conventions [5L]

Need for Machine Drawings – Introduction to SI Conventions – Introduction to types of Drawings and working Drawings for Machine Parts.

a. Conventional representation of Materials, Common Machine Elements and Parts such as Screws, Nuts, Bolts, Keys, Gears, Bearings, Springs, etc.
b. Types of Sections – Selection of sectional planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
c. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centre lines, curved and tapered features.
d. Title boxes - size, location and details - common abbreviations in general usage

Module 2: Drawing of Machine Elements and Simple Parts [20L]

Selection of Views, additional views for the following machine elements and parts with easy drawing proportions.

a. **Screw Threads and Fasteners** - Popular forms of Screw Threads, Bolts, Nuts, Stud Bolts, Tap Bolts, Set Screws.
b. **Keys** – Saddle Keys, Sunk Keys, Feather Keys, Woodruff Keys, Splines
c. **Cotter Joints** – with Sleeves, with Socket and Spigot ends, with Gibs
d. **Pin Joints** – Knuckle Joint.
e. **Riveted Joints**: Various types of Riveted Joints for plates.
f. **Welded Joints**: Various types of Welded Joints and symbols.
g. **Shaft coupling** – Sleeve or Muff Couplings, Flanged Couplings, Universal Couplings, Oldham Coupling.
h. **Pipe Joints**: Cast Iron Pipe Joints, Joints for Hydraulic Pipes, Pipe Fittings
i. **Pulleys**: Flat Belt Pulleys, V – Belt Pulleys, Rope Pulleys.
j. **Bearings**: Journal Bearings – Solid, Bushed and Collared Journal Bearings, Pivot or Foot-Step Bearings.

Module 3: Assembly Drawings [25L]

Drawings of Assembled Views for the part drawings of the following using conventions and easy drawing proportions.

a. **Engine Parts:** Steam Engines: Stuffing Box, Cross Head, Eccentric. Petrol Engine: Connecting Rod, Piston Assembly.
b. **Other Machine Parts:** Screws Jack, Plain Machine Vice, Plummer Block, Tail-stock.
c. **Valves:** Gate Valve, Screw-down Stop Valve, Spring Loaded Safety / Relief Valve, SFeed Check Valve and Aircock.

Tools used: AutoCAD and Solidworks

Note: - Internal evaluation must be done in conventional as well as using Computer Aided Drafting.

Text Books

1. Machine Drawing: K. L. Narayana, P. Kannaiah & K. Venkata Reddy; New Age Publishers, 5th Edition, 2016.
2. Machine Drawing: N.D. Bhatt; Charotar Publications, 47th Edition,2012

Reference Books

1. Ajeet Singh, "Machine Drawing", TMH Publications, 4th Edition, 2010.
2. P. S. Gill, "Machine Drawing", Kataria Publications, 16th Edition, 1996.
3. Junarkar. N. D, "Machine Drawing", Pearson Publication, 2009

Course Outcomes

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

CO1 : Understand and apply standard conventions in machine drawing, including SI units, sectional views, dimensioning, and the representation of materials and common machine elements.

CO2 : Create detailed drawings of machine components such as screws, nuts, bolts, keys, gears, bearings, springs, and shafts, adhering to appropriate drawing views and proportions.

CO3 : Develop assembly drawings for complex machine parts, including engine components, valves, and mechanical devices, ensuring clarity and accuracy in representation.

CO4 : Utilize computer-aided design (CAD) tools to model machine components and assemblies, generating orthographic and sectional views, and preparing detailed drawings.

CO5 : Interpret and prepare technical drawings that effectively communicate design intent and manufacturing requirements, facilitating the production and assembly of machine components.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	2	-	-	-	3	2	-	1	1	1
CO2	-	-	-	-	2	-	-	-	3	2	-	1	2	1
CO3	-	-	-	-	2	-	-	-	3	2	-	1	2	1
CO4	-	-	-	-	-	-	-	-	3	2	-	2	2	1
CO5	-	-	-	-	-	-	-	-	3	2	-	2	2	1
Average	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**3**	**2**	**-**	**1.4**	**1.8**	**1**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - I Sem			
Course Code: **M2133**	**INTERNSHIP - I**	L	T	P	C
		0	**0**	**2**	**1**

Guidelines:

Students should undergo two Internships. Internship-I shall be carried out under the guidance of professors from Science and Basic Engineering Subjects, with topics having some social relevance. The Internship-I is to be taken up during the summer vacation after I Year II Semester Examination and it will be evaluated in II Year I semester for 50 marks. However, the process might be initiated before the end of I Year II Semester by the concerned department. The students admitted under Lateral Entry Scheme (LES) shall carry out internship in the area of their Diploma specialization under the guidance of a faculty member of that department immediately in the first month, after their joining of the course.

Parameter	Marks
Internship Report	15
Quality of work	15
Presentation	15
Viva – Voce	05
Total	**50**

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	-	-	-	-	3	2	2	2	3	-	2	-	1
CO2	-	-	-	-	-	2	2	2	1	2	-	1	-	-
CO3	-	-	-	-	-	2	2	3	2	1	-	2	-	1
CO4	-	-	-	-	-	2	1	3	1	3	-	3	2	2
Average	**2**	**-**	**-**	**-**	**-**	**2.25**	**1.75**	**2.5**	**1.5**	**2.25**	**-**	**2**	**2**	**1.3**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 20225-26 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - I Sem			
Course Code: **M21MC2**	**GENDER SENSITIZATION** (Mandatory Course) **(**COMMON TO: CE, EEE, ME, ECE, CSE, IT, ECM, CSE(AIML),CSE(DS), AIDS & AIML)	L	T	P	C
		2	**0**	**0**	**0**

Pre-Requisites: NIL

Module 1: UNDERSTANDING GENDER [6L]

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)
Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2)
Introduction. Preparing for Womanhood. Growing up Male. First lessons in Caste. Different Masculinities.

Module 2: GENDER AND BIOLOGY [6L]

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)
Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)
Two or Many? Struggles with Discrimination.

Module 3: GENDER AND LABOUR [6L]

Housework: The Invisible Labour (*Towards a World of Equals*: Unit -3)
"My Mother doesn't Work." "Share the Load."
Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

Module 4: ISSUES OF VIOLENCE-I [6L]

Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*
Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)
Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Module 5: ISSUES OF VIOLENCE-II [6L]

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)
Blaming the Victim- "I Fought for my Life…."
Additional Reading: The Caste Face of Violence.

Text Books

1. ***"Towards a World of Equals: A Bilingual Textbook on Gender"*** written by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu.

Reference Books

1. Raj Paul Singh, Anupama Singh. Gender Sensitization: Issues and Challenges: Raj Publications: 2019.

E-Resources

- https://www.medicalnewstoday.com/articles/232363
- https://web.stanford.edu/~eckert/PDF/Chap1.pdf
- https://open.lib.umn.edu/sociology/chapter/11-1-understanding-sex-and-gender/

Course Outcomes

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

CO1. develop a better understanding of important issues related to gender in contemporary India.

CO2. sensitize to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.

CO3. attain a finer grasp of how gender discrimination works in our society and how to counter it.

CO4. acquire insight into the gendered division of labour and its relation to politics and economics.

CO5. be better equipped to work and live together as equals.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes (POs)/Program Specific Outcomes (PSOs)													
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	-	-	-	-	-	-	-	-	**2**	2	-	**3**	-	-
CO2	-	-	-	-	-	-	-	-	**2**	**2**	-	3	-	-
CO3	-	-	-	-	-	-	-	-	**2**	2	-	3	-	-
CO4	-	-	-	-	-	-	-	-	**2**	2	-	3	-	-
CO5	-	-	-	-	-	-	-	-	**2**	2	-	3	-	-
Average	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2**	**-**	**3**	**-**	**-**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - II Sem			
Course Code: **M223A**	**KINEMATICS OF MACHINERY**	L	T	P	C
		3	**1**	**0**	**4**

Pre-Requisites: Engineering Mathematics, Engineering Mechanics.

Module 1: Mechanisms and Machines [10L]

Unit I: [5L] Elements or Links– Classification– Rigid Link, flexible link, fluid link. Types of kinematic pairs sliding, turning, rolling, screw and spherical pairs– lower and higher pairs– closed and open pairs. Constrained motion– completely constrained, partially or successfully constrained and incompletely constrained.

Unit II: [5L] Mechanism and machines–kinematic chain–Degrees of freedom, Kutzbach's criteria and Grubler's criterion. Inversions of kinematic chain–inversions of quadric cycle chain, single slider crank chain and double slider crank chain. Mechanical advantage.

Module 2: Kinematics, Plane motion of body, Analysis of Mechanisms [10L]

Unit I: [4L] Velocity and acceleration–Motion of link in machine– Determination of Velocity and acceleration– Graphical method– Application of relative velocity method for simple mechanisms, Acceleration diagram for a given mechanism, Kleins construction, Coriolis acceleration, determination of Coriolis component of acceleration.

Unit II: [3L] Instantaneous center of rotation, centrode and axodes– relative motion between two bodies Three centers in line theorem– Graphical determination of instantaneous centre, diagrams for simple mechanisms and determination of angular velocity of points and links.

Unit III: [3L] Analysis of slider crank chain for displacement, velocity and acceleration of slider.

Module 3: Steering Mechanisms, Hooke's Joint, Straight Line Motion Mechanisms [8L]

Unit I: [3L] Conditions for correct steering– Davis Steering gear mechanism, Ackerman's steering gear mechanism, Difference in Davis Steering gear mechanism, Ackerman's steering gear mechanism.

Unit II: [2L] Single and double Hooke's joint– velocity ratio– Universal coupling– application– problems.

Unit III: [3L] Exact type– Peaucellier, Hart, Scott- Russul mechanism. Approximate type– Grasshopper, Watt T. Chebicheff, Robert Mechanisms. Generated Types-Pantograph.

Module 4: Cams [10L]

Definitions of cam and followers, their uses. Types of cams, Types of followers, Terminology, Types of follower Motion- Simple Harmonic Motion, Uniform Velocity, Uniform Acceleration and Retardation- Determination of Maximum velocity and maximum acceleration during outward and return strokes in the above three cases. Drawing of cam profiles with knife edge follower, roller follower and flat faced follower.

Module 5: Gears, Gear Trains [10L]

Unit I: [6L] Higher pairs, friction wheels and toothed gears–types of toothed gears. Law of gearing condition for constant velocity ratio for transmission of motion. Form of teeth-cycloidal and involute profiles. Velocity of sliding. Phenomena of interferences–Methods of interference, condition for minimum number of teeth to avoid interference. Expressions for arc of contact and path of contact.

Unit II: [4L] Introduction–Train value–Types–Simple, compound, reverted and epicyclic gear train. Methods of finding velocity ratio.

Text Books

1. Thomas Bevan, "Theory of Machines", Pearson Publications, 3rd Edition, 2011.
2. R.K Bansal, "Theory of Machines", S Chand Publications, 5th Edition, 2010

Reference Book

1. R.S Khurmi & J.K Gupta,"Theory of Machines", S Chand Publications, 14th Edition, 2013.
2. P. L. Ballaney, "Theory of Machines", Khanna publishers.
3. J S Rao and RV Dukkipati, "Mechanism and Machine Theory", New Age Publishers.

E-Resources

1. https://shorturl.at/wXt5M

Course Outcomes

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

CO1 : Classify and analyze various mechanisms, understanding their components, types of links, and kinematic pairs, and apply criteria like Grubler's and Kutzbach's to determine degrees of freedom.

CO2 : Perform kinematic analysis of planar mechanisms using graphical and analytical methods, including velocity and acceleration analysis, and apply concepts like instantaneous centers and Coriolis acceleration.

CO3 : Design and analyze cam profiles for specified follower motions, considering different types of followers and motion profiles such as uniform velocity, simple harmonic motion, and uniform acceleration and retardation.

CO4 : Understand the principles of gear mechanisms, including the law of gearing, forms of teeth (involute and cycloidal), and analyze phenomena like interference, arc of contact, and path of contact in gear pairs.

CO5 : Analyze and design gear trains, including simple, compound, reverted, and epicyclic gear trains, and apply these concepts to practical applications such as differential gears in automobiles.

CO-PO mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	1	2	-	-	-	-	-	-	-	2	2	2
CO2	3	2	2	2	-	-	-	-	-	-	-	3	2	2
CO3	3	3	2	3	2	-	-	-	-	-	-	3	3	3
CO4	3	3	2	3	1	-	-	-	-	-	-	3	1	1
CO5	3	3	3	2	1	-	-	-	-	-	-	2	2	1
Average	3	2.8	2	2.4	1.3	-	-	-	-	-	-	2.6	2	1.8

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - II Sem			
Course Code: **M223B**	**THERMAL ENGINEERING**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Engineering Physics, Thermodynamics

Module 1: Actual Cycles and their Analysis, I.C. Engines [10L]

Unit I: [5L]: Introduction – Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down, Loss due to Gas exchange Process, Volumetric Efficiency, Loss due to Rubbing Friction. Actual and Fuel Air Cycles of CI Engines.

Unit II: [5L]: Classification - Working principles, Valve and Port Timing Diagrams, Air standard, Air fuel and Actual cycles. Engine systems – Fuel, Carburettor, Fuel injection System, Ignition, Cooling and Lubrication.

Module 2: Combustion in S.I. Engines, Combustion in C.I. Engines [10L]

Unit I: [6L] Normal Combustion and abnormal combustion, Importance of flame speed and effect of engine variables. Type of Abnormal combustion – pre-ignition and knocking. Fuel requirements and fuel rating, anti-knock additives. Combustion chamber requirements and types.

Unit II: [4L] Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence. Open and divided combustion chambers and nozzles used. Fuel requirements and fuel rating.

Module 3: Testing and Performance of I.C. Engines [8L]

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.

Module 4: Compressors, Reciprocating Compressors [10L]

Unit I: [4L] Classification–positive displacement and rotodynamic machinery. Power producing and power absorbing machines – fan, blower and compressor. Positive displacement and dynamic types – reciprocating and rotary types.

Unit II: [6L] Principle of operation, work required, Isothermal efficiency, volumetric efficiency and effect of clearance. Stage compression, under cooling, saving of work, minimum work condition for stage compression.

Module 5: Rotary Compressors, Dynamic Compressors, Axial Flow Compressors [10L]

Unit I: [3L] Roots Blower, vane sealed compressor, Lysholm compressor–mechanical details and principle of working. Efficiency considerations.

Unit II: [4L] Centrifugal compressors – Mechanical details and principle of operation, velocity and pressure variation. Energy transfer-impeller blade, shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient. Velocity diagrams – power.

Unit III: [3L]: Mechanical details and principle of operation– velocity triangles, energy transfer per stage, degree of reaction, work done factor, isentropic efficiency, pressure rise calculations and polytropic efficiency.

Text Books

1. V. Ganesan, "I.C. Engines" , Tata McGraw Hill, 4th Edition, 2012.
2. K.K. Ramalingam, "I.C. Engines", SciTech Publishers, 2nd Edition, 2011.

Reference Books

1. R.P. Sharma, "I.C. Engines", DhanpathRai Publications, 8th Edition, 2010.
2. R.K. Rajput, "Thermal Engineering", Lakshmi Publications, 9th Edtn, 2018.

E-Resources

1. https://shorturl.at/c63gv

Course Outcomes

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

CO1 : Analyze Actual Cycles in I.C. Engines: Understand and evaluate the differences between air-standard and actual cycles, including factors like time loss, heat loss, and volumetric efficiency.

CO2 : Understand Engine Systems and Components: Comprehend the working principles of various engine systems such as fuel, ignition, cooling, and lubrication, and their integration into I.C. engines.

CO3 : Evaluate Combustion Processes: Distinguish between normal and abnormal combustion in S.I. and C.I. engines, and assess the impact of engine variables on combustion characteristics.

CO4 : Conduct Engine Performance Testing: Measure and interpret engine performance parameters including cylinder pressure, fuel consumption, and brake power, and analyze heat balance sheets.

CO5 : Understand Compressor Operations: Grasp the principles of operation, efficiency considerations, and performance analysis of various compressors, including reciprocating, rotary, and axial flow types.

CO-PO mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	1	2	-	-	-	-	-	-	-	2	2	2
CO2	3	2	2	2	-	-	-	-	-	-	-	3	2	2
CO3	3	3	2	3	2	-	-	-	-	-	-	3	3	3
CO4	3	3	2	3	1	-	-	-	-	-	-	3	1	1
CO5	3	3	3	2	1	-	-	-	-	-	-	2	2	1
Average	3	2.8	2	2.4	1.3	-	-	-	-	-	-	2.6	2	1.8

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - II Sem			
Course Code: **M223C**	**FLUID MECHANICS AND HYDRAULIC MACHINES**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Engineering Physics, Engineering Mathematics, Engineering Mechanics

Module 1: Fluid Statics, Pressure Measurement [8L]

Unit I: [4L] Dimensions and units – physical properties of fluids – specific gravity – viscosity and surface tension –Vapour pressure and their influence on fluid motion – buoyancy.

Unit II: [4L] Atmospheric, gauge and vacuum pressures – measurement of pressure – Piezometer, U-tube and differential manometers.

Module 2: Fluid Kinematics, Fluid Dynamics [10L]

Unit I: [5L] Stream line, path line and streak lines and stream tube – classification of flows – steady and unsteady, uniform and non-uniform, laminar and turbulent, rotational and irrotational flows – equation of continuity for one dimensional flow and three-dimensional flows.

Unit II: [5L] Surface and body forces –Euler"s and Bernoulli"s equations for flow along a stream line – momentum equation and its application on pipe bend.

Module 3: Closed conduit flow, Boundary Layer Concepts [8L]

Unit I: [4L] 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 II: [4L] 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.

Module 4: Basics of turbo machinery, Hydraulic Turbines [10L]

Unit I: [3L] 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.

Unit II: [3L] Classification of turbines – Heads and efficiencies – impulse and reaction turbines – Pelton wheel – Francis turbine and Kaplan turbine – working proportions – work done, efficiencies – hydraulic design –draft tube theory, functions and efficiency.

Unit III: [4L] Geometric similarity, Unit and specific quantities – characteristic curves – governing of turbines – selection of type of turbine cavitation – surge tank –water hammer.

Module 5: Centrifugal pumps, Reciprocating pumps [9L]

Unit I: [5L] Centrifugal pumps: Classification – working –work done – barometric head losses and efficiencies – specific speed – performance characteristic curves – NPSH.

Unit II: [4L] Reciprocating pumps: Working – Discharge – slip indicator diagrams.

Text Books

1. Dr. P.N. Modi, Dr. S.M. Seth, "Hydraulics and Fluid Mechanics including Hydraulics Machines", Standard Book House, 20th Edition, 2015.
2. Er. R.K. Rajput, "Fluid Mechanics and Hydraulic Machines", S. Chand, 6th Edition.

Reference Books

1. Dr. D.S. Kumar, "Fluid Mechanics and Fluid Power Engineering", KATSON Publications,
2. D. Rama Durgaiah, "Fluid Mechanics and Machinery", New Age International (P) Ltd, Publishers, Reprint 2004.

E-Resources

1. https://shorturl.at/FmZ8T

Course Outcomes

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

CO1 : Understand Fluid Properties: Define and explain fundamental fluid properties such as density, viscosity, surface tension, and specific gravity, and analyze their influence on fluid behavior.

CO2 : Apply Fluid Statics Principles: Calculate pressure variations in static fluids using concepts like buoyancy, hydrostatic forces, and manometric devices.

CO3 : Analyze Fluid Flow Dynamics: Utilize the continuity equation, Bernoulli's equation, and momentum principles to solve problems related to steady and unsteady flows in various engineering applications.

CO4 : Examine Boundary Layer Phenomena: Understand the formation and characteristics of boundary layers, including laminar and turbulent flows, and their impact on drag and lift in fluid systems.

CO5 : Evaluate Turbo Machinery Performance: Assess the performance of hydraulic turbines and centrifugal pumps by analyzing parameters like efficiency, specific speed, and characteristic curves.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	-	1	-	-	-	-	-	-	-	2	1	-
CO2	3	3	2	2	1	-	-	-	-	-	-	2	1	1
CO3	3	3	2	2	2	-	-	-	-	-	-	3	2	1
CO4	3	3	3	3	1	-	-	-	-	-	-	3	2	2
CO5	3	3	3	2	1	-	-	-	-	-	-	3	2	1
Average	**3**	**2.8**	**2.5**	**2**	**1.2**	**-**	**-**	**-**	**-**	**-**	**-**	**2.6**	**1.6**	**1.2**

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - II Sem			
Course Code: **M223D**	**INSTRUMENTATION AND CONTROL SYSTEMS**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Engineering Physics, Basic of Electrical and Electronics Engineering, Materials Science.

Module1: [10]

Unit 1: Definition: Basic principles of measurement – Measurement systems, generalized configuration and functional descriptions of measuring instruments – examples. Dynamic performance characteristics – sources of error, Classification and elimination of error.

Unit 2: Measurement of Displacement: Theory and construction of various transducers to measure displacement – Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

Module 2: [10]

Unit 1: Measurement of Temperature: Classification – Various Principles of measurement – Expansion, Electrical Resistance – Thermistor – Thermocouple – Pyrometers – Temperature Indicators.

Unit 2: Measurement of Pressure: Classification – different principles used. Manometers, Bourdon pressure gauges, Bellows – Diaphragm gauges. Low pressure measurement – Thermal conductivity gauges – ionization pressure gauges, Mcleod pressure gauge.

Module 3: [12]

Unit 1: Measurement of Level: Direct methods – Indirect methods – Capacitive, Radioactive, Ultrasonic, Magnetic, Cryogenic Fuel level indicators –Bubbler level indicators

Unit 2: Flow measurement: Rotameter, magnetic, Ultrasonic, Turbine flowmeter, Hot – wire anemometer, Laser Doppler Anemometer (LDA).

Module 4: [12]

Unit 1: Measurement of Speed: Mechanical Tachometers – Electrical tachometers – Stroboscope, Non- contact type of tachometer.

Unit 2: Measurement of Acceleration and Vibration: Different simple instruments – Principles of Seismic instruments – Vibrometer and accelerometer using this principle- Piezo electric accelerometer.

Module 5: [12]

Unit 1: 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.

Unit 2: 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.

Text Books

1. Principles of Industrial Instrumentation & Control Systems/Chennakesava R alaavala, - Cengage Learning/1st Edition, 2009.
2. Measurement Systems: Applications and Design: D.S. Kumar, Anuradha Agencies.
3. Instrumentation, Measurement and Analysis: B.C. Nakra & K.K. Choudhary, TMH.

Reference Books

1. Instrumentation and Control Systems: S. Bhaskar, Newage Publications, 1998.
2. Measurement Systems: Applications & design, E. O. Doebelin, TMH, 6th Edition.
3. Instrumentation, Measurement & Analysis, B.C. Nakra & K.K. Choudhary, TMH, 4th Edition.

E-Resources

1. https://shorturl.at/L0RoP

Course Outcomes

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

CO1 : Understand Measurement Principles: Explain the fundamental principles of measurement systems, including the classification and functional descriptions of various measuring instruments.

CO2 : Analyze Dynamic Performance: Assess the dynamic performance characteristics of measurement systems and identify sources of errors, implementing methods for error classification and elimination.

CO3 : Apply Transducer Technologies: Select and apply appropriate transducers for measuring displacement, temperature, pressure, level, flow, speed, acceleration, and vibration, understanding their working principles and calibration procedures.

CO4 : Design Control Systems: Design and analyze open and closed-loop control systems, including servomechanisms, and develop transfer functions for first and second-order mechanical systems.

CO5 : Implement Measurement Techniques: Utilize various instruments and techniques for measuring humidity, force, torque, and power, and understand their applications in control systems.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	2	2	-	-	-	-	-	-	-	2	1	-
CO2	3	2	2	2	-	-	-	-	-	-	-	2	1	-
CO3	3	2	2	2	-	-	-	-	-	-	-	2	2	-
CO4	3	3	3	2	-	-	-	-	-	-	-	2	2	1
CO5	3	3	3	2	-	-	-	-	-	-	-	2	2	1
Average	3	2.6	2.4	2	-	-	-	-	-	-	-	2	1.6	1

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - II Sem			
Course Code: **M223E**	**COMPOSITE MATERIALS**	L	T	P	C
		3	**0**	**0**	**3**

Pre-Requisites: Engineering Materials.

Module 1: **[10L]**

Introduction: Definition, Classification of Composite materials based on structure, based on matrix, Advantages of composites, Applications of composites, Functional requirements of reinforcement and matrix.

Module 2: **[10L]**

Types of reinforcements and their properties: Fibers: Carbon, Boron, Glass, Aramid, Al2O3, SiC, Nature and manufacture of glass, carbon and aramid fibres, Comparison of fibres. Role of interfaces: Wettability and Bonding, the interface in Composites, Interactions and Types of bonding at the Interface, Tests for measuring Interfacial strength.

Module 3: **[10L]**

Fabrication of Polymeric Matrix Composites, Structure and properties of Polymeric Matrix Composites, Interface in Polymeric Matrix Composites, Applications; Fabrication of Ceramic Matrix Composites, Properties of Ceramic Matrix Composites, Interface in Ceramic Matrix Composites, Toughness of Ceramic Matrix Composites Applications of Ceramic Matrix Composites.

Module 4: **[15L]**

Fabrication of Metal Matrix Composites: Solid state fabrication, Liquid state fabrication and In-situ fabrication techniques; Interface in Metal Matrix Composites: Mechanical bonding, Chemical bonding and Interfaces in In-situ Composites; Discontinuously reinforced Metal Matrix Composites, Properties and Applications. Fabrication of Carbon fiber composites, properties, interface and applications.

Module 5: **[15L]**

Micromechanics of Composites: Density, Mechanical Properties: Prediction of Elastic constants, Micro mechanical approach, Halpin-Tsai equations, Transverse stresses; Thermal properties: Hydrothermal stresses and Mechanics of Load transfer from matrix to fiber.

Text Books

1. Composite Materials – Science & Engineering, K.K. Chawla, Springer-Verlag, New York, 1987.
2. An Introduction to Composite Materials, Hull, Cambridge, 2nd Edt. 1997.

Reference Books

1. Composites, Engineered Materials Handbook, Vol. 1, ASM International, Ohio, 1988.
2. Structure and Properties of Composites, Materials Science and Technology, Vol. 13, VCH, Weinheim, Germany, 1993.
3. Composite Materials: Engineering and Science, F.L. Matthews and R.D. Rawlings, Chapman & Hall, London, 1994.

E-Resources

1 https://shorturl.at/Whwhv

Course Outcomes

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

CO1 : Understand the crystal structures of a wide range of ceramic materials and glasses.
CO2 : explain how common fibers are produced and how the properties of the fibers are related to the internal structure.
CO3 : select matrices for composite materials in different applications.
CO4 : describe key processing methods for fabricating composites.
CO5 : Analyze the mechanical behavior and failure modes of composite materials under various loading conditions.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**
CO1	2	1	3	2	1	-	-	-	-	3	-	3	3	3
CO2	2	3	3	3	3	-	-	-	-	3	-	3	3	3
CO3	2	2	3	2	2	-	-	-	-	3	-	3	3	3
CO4	2	2	3	2	2	-	-	-	-	3	-	3	3	3
CO5	2	2	3	2	2	-	-	-	-	3	-	3	3	3
Average	2	2	3	2.2	2	-	-	-	-	3	-	3	3	3

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - II Sem			
Course Code: **M2231**	**FLUID MECHANICS AND HYDRAULIC MACHINES LAB**	L	T	P	C
		0	**0**	**2**	**1**

Pre-Requisites: Engineering Physics, Mechanics of Fluids and Hydraulic Machines.

List of Experiments

1. Verification of Bernoulli's Theorems
2. Calibration of Venturi meter
3. Calibration of Orifice meter.
4. Calibration of Mouth piece / Orifice apparatus.
5. Determination of loss of head due to sudden contraction in pipeline
6. Determination of friction factor for a given pipe line
7. Impact of jets on Vanes
8. Performance Test on Pelton Wheel
9. Performance test on Francis Turbine.
10. Performance Test on Reciprocating Pump.
11. Performance Test on Single Stage Centrifugal Pump.
12. Performance Test on Multi Stage Centrifugal Pump.

Course Outcomes

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

CO1: Verify Bernoulli's theorem and calibrate flow measuring devices.

CO2: Assess head losses and determine friction factors in pipelines.

CO3: Evaluate the impact of fluid jets on various vane configurations.

CO4: Analyze the performance characteristics of turbines and pumps.

CO5: Apply experimental data to validate theoretical fluid mechanics principles.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	3	-	2	3	-	-
CO2	-	-	-	-	-	-	-	-	3	-	2	3	1	1
CO3	-	-	-	-	-	-	-	-	3	-	3	3	1	1
CO4	-	-	-	-	-	-	-	-	3	-	3	3	-	-
CO5	-	-	-	-	-	-	-	-	3	-	2.5	3	1	1
Average	-	-	-	-	-	-	-	-	3	-	2	3	-	-

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - II Sem			
Course Code: **M2232**	**INSTRUMENTATION AND CONTROL SYSTEMS LAB**	L	T	P	C
		0	**0**	**2**	**1**

Pre-Requisites: Engineering Mathematics, Engineering Physics and Chemistry

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 transducer
11. Study of McLeod gauge for low pressure.
12. Study of D.C position control system.
13. Study of D.C speed control system.

Course Outcomes

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

CO1: Calibrate the measuring instruments, and conduct the experiments with minimum error in measurements.

CO2: Apply the basic knowledge of Linear Displacement, Temperature, flow, speed and strain measurements, with good accuracy and precision, in practical situations.

CO3: Use the various Metrological instruments like Vernier calipers, Micrometers, Bevel Protractor, Talysurf, and Tool Maker's Microscope.

CO4: Use Bevel Protractor, Tool Maker's Microscope, Sine bar for Angle and Taper measurements.

CO5: Interpret the results of experiments and draw correct inferences.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	3	-	2	3	2	3
CO2	-	-	-	-	-	-	-	-	3	-	2	3	3	3
CO3	-	-	-	-	-	-	-	-	3	-	2	3	3	3
CO4	-	-	-	-	-	-	-	-	3	-	2	3	-	3
CO5	-	-	-	-	-	-	-	-	1	-	2	3	3	3
Average	-	-	-	-	-	-	-	-	2.6	-	2	3	2.8	3

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024-25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year - II Sem			
Course Code: **M2233**	**THERMAL ENGINEERING LAB**	L	T	P	C
		0	**0**	**2**	**1**

Pre-Requisites: Thermodynamics, Thermal Engineering.

List of Experiments

1. To determine Flash and Fire point for a given liquid fuel – Pensky Marten / Abel's Apparatus
2. To determine viscosity of given oil by Redwood Viscometer – I
3. To determine Carbon Residue of given fuel
4. To determine Calorific Value of a given fuel/ oil
5. I.C. Engines Valve Timing Diagram.
6. I.C. Engines Port Timing Diagram.
7. I.C. Engines Performance Test (4 Stroke Diesel engine)
8. I.C. Engines Motoring Test (2 Stroke Petrol engine)
9. Evaluation of Engine friction by conducting Morse test on 4-stroke Multi cylinder Petrol Engine
10. Heat Balance Sheet on IC Engine
11. 4- Stroke Petrol Engine Assembly and Disassembly
12. Performance Test on Reciprocating Air – Compressor Test Rig

Course Outcomes

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

CO1. Evaluate the properties of fuels like Flash Point, Fire point, Viscosity and Calorific Value using Abel's Apparatus, Redwood Viscometer, Calorimeter.
CO2. Obtain the Valve Timing Diagram and Port Timing Diagram of IC engines
CO3. Conduct Performance Tests on four-stroke diesel engine and two-stroke petrol engine and Morse test on four-stroke Multi cylinder Petrol Engine
CO4. Apply the knowledge to Disassemble and assemble the parts of IC engine.
CO 5: Conduct the Performance Test on Reciprocating Air – Compressor

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	-	-	-	-	-	-	-	-	2	3	-	2	3	3
CO2	-	-	-	-	-	-	-	-	2	3	-	2	3	3
CO3	-	-	-	-	-	-	-	-	2	3	-	2	3	3
CO4	-	-	-	-	-	-	-	-	2	3	-	2	3	3
CO5	-	-	-	-	-	-	-	-	2	3	-	2	3	3
Average	-	-	-	-	-	-	-	-	2	3	-	2	3	3

Correlation: 3–Strong; 2–Medium; 1-Weak

AY: 2024 -25 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech: ME II Year – II Sem			
Course Code: **M22MC1**	**ENVIRONMENTAL SCIENCE**	L	T	P	C
		2	**0**	**0**	**0**

Pre-Requisites: Nil.

Module 1:

Unit-I: Ecosystem and Natural Resources

Concept, Classification of Resources: Water resources, Land resources, land degradation, Forest resources, Mineral resources, Energy resources. Concept of ecosystem, Classification of ecosystem, Functions of ecosystem. Biodiversity, Level, values, hotspots of biodiversity, Threats to Biodiversity, Conservation of Biodiversity.

Module 2:

Unit-I: Global Environmental Problems and Global Efforts

Deforestation, Greenhouse effect, Global Warming, Sea level rise, Ozone depletion. International conventions/protocols: green-belt-development, Concept of Green Building, Clean Development Mechanism (CDM).

Unit-2: Environmental Impact Assessment (EIA) And Environmental Management Plan

Definition of Impact, classification of impacts, methods of baseline data acquisition. Impacts on different components: such as human health resources, air, water, flora, fauna and society, impact assessment methodologies. Environmental management plan (EMP).

Module 3:

Unit-1: Environmental Policy, Legislation, Rules and Regulations

Environmental Protection Act: Air (Prevention and control of pollution) Act-1981, Water (Prevention and control of pollution) Act-1974, Forest Conservation Act**.**

Unit-2: Towards Sustainable Future:

Concept of Sustainable Development, Threats to Sustainability, Strategies for achieving Sustainable development, Environmental Ethics, Environmental Economics, Concept of Green Computing.

Text Books:

1. "Textbook of Environmental Science And Technology" by M Anji Reddy, BS Publications, 2007.
2. "Principles of Environmental Science and Engineering" by Rao P. Venugopala, Prentice Hall India Learning Private Limited (1 January 2006)

Reference Books:

1. "Environmental Studies" by Benny Joseph, McGraw Hill Education 2008.
2. "Textbook of Environmental Studies for Undergraduate Courses" by Erach Bharucha 2005, University Grants Commission, University Press

E-Resources

1. https://nptel.ac.in/courses/120/108/120108004/#

Course Outcomes:

On completion of the course, the students will be able to:

1.**Compare** the different natural resources available and how to use them.

2. **Describe** about biodiversity.

3. **Analyze** the Global Environmental Problems and Global Efforts.

4. **Categorize** the global environmental problems.

5. **Prioritize** the Sustainable development

CO-PO/PSO Mapping

CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak														
Course Outcomes (COs)	**Program Outcomes (POs)**												**Program Specific Outcomes***	
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	3	3	2	2	-	-	1	-	-	-	-	1	2	1
CO2	-	-	-	-	-	3	3	-	-	-	-	2	1	1
CO3	3	3	2	2	-	-	1	-	-	-	-	1	2	1
CO4	3	3	2	2	-	-	1	-	-	-	-	1	2	1
CO5	-	-	-	-	-	3	3	-	-	-	-	2	2	1
Average	1.8	1.8	1.2	1.2	-	1.2	1.8	-	-	-	-	1.4	1.8	1

Correlation: 3–Strong; 2–Medium; 1-Weak