

ACADEMIC REGULATIONS

COURSE STRUCTURE AND

DETAILED SYLLABUS

MINING ENGINEERING

B. TECH FOUR YEAR UG COURSE

(Applicable for the batches admitted from 2022-2023)

REGULATION: R22
(I & II Year Syllabus)



J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC AUTONOMOUS)

Bhaskar Nagar, Yenkapally (V), Moinabad (M), Hyderabad – 500075,
Telangana, India

INSTITUTE-VISION AND MISSION

VISION:

To be a Centre of Excellence in Engineering and Management Education, Research and Application of Knowledge to benefit Society with blend of Ethical Values and Global Perception.

MISSION:

M1: To provide world class engineering education, encourage research and development.

M2: To evolve innovative applications of technology and develop entrepreneurship.

M3: To mould the students into socially responsible and capable leaders.



DEPARTMENT-VISION AND MISSION

VISION:

To impart academic excellence, technological vibrance, innovation, leadership, entrepreneurship, life-long learning, and self-motivation to excel in the students for their bright future in the mining industry.

MISSION:

M1: To enrich the students with professionalism, emotional maturity, and accountability to prepare them to face the endless challenges in the mining industry.

M2: To make the students well-informed with the everchanging trends and sustainable development practices in the mining industry.

M3: To ensure the holistic development of the students to prepare them as future leaders.



Program Educational Objectives (PEOs)

PEO1

To provide knowledge in science and engineering concepts related to mineral exploration, mining, and beneficiation, with the objective of developing application skills for solving real life problems for the benefit of the society.

PEO2

To nurture to students in a quality environment including entrepreneurship skills, spirit of teamwork and professional excellence, to prepare them for facing the future technical, managerial, and financial challenges for sustainable mining.

PEO3

To develop in depth knowledge and technical competence with the flair for R&D, innovation, and lifelong learning.

Program Outcomes and Program Specific Outcomes of CSE Department (Pos & PSOs)

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3: Design / Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

PO4: Conduct investigations of complex problems: using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

PO5: Modern Tool Usage: Create, select, and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO7: Environment and Sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO9: Individual and Teamwork: Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as

being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project Management and Finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long Learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Any signatory needs to provide an overview of its learning outcomes and confirm that compliance of programs.

Program Specific Outcomes (PSO)

PSO1

Understand and apply concepts of rock mechanics and ventilation in design, analysis, and planning of mines.

PSO2

Understand allied subjects like survey, mechanization, mineral Processing, environmental management in mines and geology.

JBIET Academic Regulations - R22

Applicable to

B.Tech Regular Four Year Degree Programme

(For the Batches admitted from the Academic Year 2022- 2023)

&

B.Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2023- 2024)



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B.Tech (Lateral Entry Scheme)

(For the Batches admitted from the Academic Year 2023- 2024)

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

JB Institute of Engineering and Technology (hereinafter referred to as JBIET) academic regulations **JBIET - R22** are given here under. These regulations approved by the Academic Council shall be in force and applicable from the academic year 2022-23 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 2022-23.

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	25	Mining Engineering (MIE)
9	66	Computer Science and Engineering (Artificial Intelligence and Machine Learning)-CSE(AI&ML)
10	67	Computer Science and Engineering (Data Science)-CSE(DS)
11	72	Artificial Intelligence and Data Science(AI&DS)
12	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 (EAMCET) 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 instructions for the entire Undergraduate Programme in Engineering & Technology is English only.

3.0 Duration of the UG Program

Each Under Graduate (**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.

3.1 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.

3.2 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.

4.0 B. Tech Programme Structure

The curriculum 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 Subject/ Course Classification

S. No.	Broad Course Classification	Course Group/ Category	Course Description
1	Foundation Courses (FnC)	BS – Basic Sciences	Includes Mathematics, Physics and Chemistry subjects
2		ES- Engg. Sciences	Includes fundamental engineering subjects
3		HS – Humanities and Social sciences	Includes subjects related to Humanities, Social sciences 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		Industrial training / Mini- project	Industrial training/ Summer Internship/ Industry Oriented Mini-project/Mini-project
7	Elective Courses (EIC)	PE – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.
8		OE – Open Electives	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/ branch of Engineering.
10	Audit courses (AC)	-	Value Added Course / Audit Courses (Non-Credit)
11	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.	23
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.	57
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.	15
7	Mini-project / Project Work / Internship / Industrial training / Seminar	15
8	Mandatory Courses / Audit Courses.	Non-Credit
TOTAL		160

5.0 Credit System: 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/D: C (Lecture periods: Tutorial periods: Practical/Drawing 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.

For Internship and Project Work credits are assigned based on the complexity of the work to be carried out.

The four-year curriculum of any B. Tech Program of study shall have a total of 160 credits. However, the curriculum for students admitted under lateral entry shall have a total of 122 credits.

6.0 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.

7.0 Course Registration

7.1. 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.

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

7.3 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 Head of the Department, faculty advisor and the student.

7.4 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.

7.5 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.

7.6 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).

7.7 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.

7.8 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 cannot opt for an open elective subject offered by his own (parent) department, if it is already listed under any category of the subjects offered by parent department in any semester.

7.9 Professional Electives: The students have to choose requisite number of professional electives (as prescribed in the course structure) from the list of professional electives.

7.10 Elective Courses (Professional Electives and Open Electives) shall be offered by a Department if a minimum of 30 students register for that course.

8.0. Academic Requirements

8.1 Attendance Requirements

8.1.1 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 (excluding attendance in Mandatory Courses and Audit Courses) for that semester. The attendance of Mandatory and Audit Non-Credit Courses should be maintained separately. Two periods of attendance for each theory subject shall be considered if the student appears for the mid-term examination of that subject.

8.1.2 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.

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

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

8.1.5 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. They will not be promoted to the next semester.

8.1.6 Students will not be promoted to the next semester and no grade allotments or SGPA / CGPA calculations will be done for such students for the entire semester in which they have been detained.

8.1.7 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.

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

8.2 Credit Requirements

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

8.2.2. 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.

8.2.3. 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.

9.0 Break of Study from a Program (Gap Year)

9.1 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*.

9.2 In case, a student wishes to extend the gap year for one more consecutive year, he 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 has taken break of study.

9.3 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, Principal shall decide whether to permit the student to avail the gap year or not.

9.4 The students permitted to rejoin the program 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 Head of the Department, at the beginning of the readmitted semester for registering additional / equivalent courses to comply with the curriculum in-force.

9.5 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).

9.6 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.

10.0. Evaluation-Distribution and Weightage of marks

10.1 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

10.2. Continuous Internal Evaluation (CIE)

10.2.1 Theory Courses: For theory courses, during the semester there shall be 2 mid-term examinations (*internal exams of 20 marks each*), 2 quizzes of 5 marks each), 4 Unit tests of 10 marks each and 2 assignments carrying 5 marks each.

S. No	Component	Frequency of Evaluation	Marks for Each test	Final Marks (Average)
1	Mid Examinations	2	20	
2	Quiz Test	2	5	
3	Unit Tests	4	10	
4	Assignments	2	5	
Total			40	40

(a) **Quiz Examinations (5 marks):**

Each quiz examination will be of 20 minutes duration consisting of objective questions for 5 marks. The objective question paper is set with 20 questions of multiple choice, fill-in the blanks and matching type of questions. The Quiz examination shall be conducted after each spell of instructions.

(b) **Mid-term Examinations (20 marks):**

Each mid-term examination will be of 1 hour 20 minutes consisting of descriptive questions (long answer) for 20 marks. The descriptive paper is four questions of 5 marks each with either / or choice. 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.

(c) **Unit Tests (10 Marks):**

The Unit Tests shall be conducted by the faculty member handling the subject. The duration of Unit Test shall be 1 hour. The question paper of Unit Test shall be of descriptive type with 3 questions each of 5 marks out of which student shall answer any two. Unit Test-1 and 2 shall be conducted before I Mid Term Examination covering the syllabus of Module-1, Module-2 respectively. Unit Test-3 and 4 shall be before II Mid Term Examination covering the syllabus of Module-3, Module-4 and Module-5 respectively. The average of marks obtained from Unit Test 1,2 and the

average of marks obtained Unit Test 3,4 is to be considered for CIE-I and CIE-II respectively.

(d) **Assignments (5 marks):**

There shall be two assignments for 5 marks each. Assignment-1 shall be submitted before First mid examinations covering the topics from Module-1 and Module-2, and the Assignment-2 shall be submitted before Second 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.

- (e) If a student is absent for any Mid-Term Examinations 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

10.2.2 Laboratory Courses

Continuous Internal Evaluation (CIE): The continuous internal evaluation for laboratory courses is based on the following parameters:

There shall be Day-to-Day Evaluation for 30 marks which includes day to day Attendance (5 Marks), observation writing(5 Marks), Experimental setup/Program writing(5 Marks), Experiment conduction/Program Execution(5 Marks), Record writing(5 Marks), Viva Voce(5 Marks).

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

10.3 Semester End Examinations (SEE)

10.3.1 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.

10.3.2 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.

10.4 Internship

The students should undergo two Internships. Internship-I shall be carried out under the guidance of professors from Science, 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

10.5 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.

10.6 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.

10.7 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 Head of the Department, Project Coordinator, Project supervisor and one senior faculty member shall evaluate the Project Work for 50 marks. **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 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**. 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 has to reappear for the same in the next subsequent semester, as and when it is scheduled.

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

10.8 Mandatory Courses (MC)

Mandatory courses carry "ZERO" credits. There shall be NO Semester-end examination. However, attendance in Mandatory courses 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. 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.

10.9 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 13.1 and the same shall be considered for internal marks and attendance.

11.0 Passing Standards

11.1 A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each subject/ course/ Laboratories/ Project Stage-II etc. which are having both CIE and SEE, only if he/she secures not less than **35% of marks (21 out of 60 marks)** in the semester end examination and a **minimum of 40% of marks (40 marks out of 100) in the sum total** of the *continuous internal evaluation (CIE) and semester end examination (SEE)* taken together.

11.2 A student is deemed to have fulfilled the minimum academic requirements and earned the credits allotted to subjects having only internal evaluation (CIE), such as Internships / Industry Oriented Mini Project / Seminar / Project Stage - I if the student secures not less than 40% marks in each of them. However, a student who fails to secure minimum 40% marks or abstains from such subjects, he / she will be permitted to appear in the re-examination which shall be conducted before completion of Semester End Examinations. If the student fails in such re-examination he/she has

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

11.3 The student shall be deemed to have failed to earn the credits allotted to subjects having only internal evaluation (CIE), if he (i) does not submit a report on Industrial Oriented Mini Project/Summer Internships, Project Stage-I or does not make a presentation of the same before the evaluation committee as per schedule, or (ii) does not present the seminar or (iii) secures less than 40% marks in Industrial Oriented Mini Project/Summer Internship and seminar evaluations.

11.4 Such failed students 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.

11.5 Recounting/Revaluation/Challenging Evaluation: Students shall be permitted to apply for Recounting /Revaluation/ Challenging Evaluation 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/Challenging Evaluation, 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.

11.6 Supplementary Examinations:

The supplementary examinations Odd semester shall be conducted during even semester regular/supplementary examinations and even semester supplementary examinations during Odd semester regular supplementary examinations.

Advance supplementary examinations shall be conducted to the students failed in the IV B.Tech - II Semester Regular Examinations. A notification Advance supplementary examinations shall be released after the announcement of regular results.

12.0 Promotion Rules

The students shall be deemed to have promoted to higher classes i.e. from I Year to II year , II year to III Year and III year to IV Year only after earning the below mentioned credits from theory and laboratory courses registered by him/her. The tables given in 10.1, 10.2 provide the details of the credits to be earned by the student (admitted under Regular and Laterally Entry Scheme respectively) to get promoted to higher classes.

12.1 Promotion Rules for Regular 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	(i) Regular course of study of first year second semester.
		(ii) Must have secured at least 19 credits out of 38 credits i.e., 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3.	Second year first semester to second year second semester	Regular course of study of second year first semester.
4	Second year second semester to third year first semester	(i) Regular course of study of second year second semester.
		(ii) Must have secured at least 40 credits out of 80 credits i.e., 50% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Third year first semester to third year second semester	Regular course of study of third year first semester.
6	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester.
		(ii) Must have secured at least 61 credits out of 122 credits i.e., 50% 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.

12.2 Promotion Rules for Lateral Entry Students

S. No	Promotion	Conditions to be fulfilled
1	Second year first semester to second year second semester	Regular course of study of second year first semester.
2	Second year second semester to third year first semester	(i) Regular course of study of second year second semester.
		(ii) Must have secured at least 21 credits out of 42 credits i.e., 50% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
3	Third year first semester to third year second semester	Regular course of study of third year first semester.
4	Third year second semester to fourth year first semester	(i) Regular course of study of third year second semester.
		(ii) Must have secured at least 42 credits out of 84 credits i.e., 50% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student takes those examinations or not.
5	Fourth year first semester to fourth year second semester	Regular course of study of fourth year first semester

13.0 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.

13.1 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 in successfully completing the MOOC course in the first attempt, he/she shall successfully 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 R22.

13.2 Mandatory Massive Open Online Courses (MOOCs)

A student has to undergo one mandatory MOOC course (Professional Elective-V) of 3 credit from the online MOOC platforms listed in 13.0 during IV-I semester. The department has to finalize the electives offered on MOOC platform at the end of III-I semester and take prior approval from the BOS for the MOOC course (including syllabus) to be registered by the student.

14.0 Awarding Grace Marks

A student who fails in two theory courses falling short of a few marks is eligible for 0.15% of total marks as Grace Marks.

- Grace marks addition is applicable for maximum of 2 subjects.
- Grace marks can be added only for external examinations.
- Among all the external examinations appeared by the student in a specific subject, the highest marks are considered for adding Grace Marks.
- The provision of Grace Marks is also extended for class change.

The Description of class change is given below:

- i. Class Change from 49.85 % to 50 % for Pass Class to Second Class
- ii. Class Change from 59.85 % to 60 % for Second Class to First Class
- iii. Class Change from 69.85 % to 70 % for First Class to First Class with distinction

Note: Grace marks cannot be added to internal marks.

15.0 Internal improvement examination

Student is permitted to appear for improvement of internal marks of all papers of the B. Tech in which the candidate has not passed due to the shortage of Internal Marks. Students who secured internal marks less than specified marks are only eligible to write the Internal Improvement Examination. The specified marks can be computed using the following formula.

➤ For B. Tech Course: $0.4 * \text{Total-marks} - 0.35 * \text{External-marks}$

- Students who have completed all semesters of their, B. Tech course work can only avail this option.
- This internal improvement option is extended up to double the duration of the course work.
- In case of Students who secure less marks in internal improvement examination than his/her previous internal marks or if the student is has registered for Internal Improvement but has not appeared / absent, the old marks will be retained.
- A separate notification shall be released by the JBIET examination branch for conduction of this examination and the students shall register for this option at the time of this notification.

16.0 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.

16.1 The student shall pursue a program 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 program of study for not less than three academic years and not more than six academic years.

16.2 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.

16.3 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

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

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. program, 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 for 2-Year UG Diploma Certificate will not be permitted to Re-join in B. Tech. III Year – I Semester and continue for completion of remaining years of study for 4-Year B. Tech. Degree.

16.5 Award of Class

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

- i. Students with final CGPA (at the end of the under graduate programme) ≥ 7.50 shall be placed in '**first class with distinction**'.
- ii. Students with final CGPA (at the end of the under graduate program me) ≥ 6.50 but < 7.50 , shall be placed in '**first class**'.
- iii. Students with final CGPA (at the end of the under graduate program me) ≥ 5.50 but < 6.50 , shall be placed in '**second class**'.
- iv. All other students who qualify for the award of the degree, with final CGPA (at the end of the undergraduate programme) ≥ 5.00 but < 5.50 , shall be placed in '**pass class**'.

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

17.0 Transitory Regulations:

The transitory guidelines are applicable to the students

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

17.2 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

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

Students readmitted under conditions mentioned 16.1, 16.2 and 16.3 shall satisfy all the eligibility requirements as mentioned in 3.0

If a student readmitted to R22 Regulations, has already studied any subject with 80% of syllabus common in his / her previous regulations, that particular subject in R22 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 R22 regulations, remedial classes shall be arranged by the concerned HoD.

18.0. Grading Procedure

18.1 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.

18.2 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 $GP \geq 5$ ('C' grade or above).

18.3 The Semester Grade Point Average (SGPA) is calculated by dividing the sum of Credit Points ($\sum CP$) 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:

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

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.

18.4 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.

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

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

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	Correspondin g 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.

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

18.6 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 he

passed his last exam in that semester. However, Mandatory Courses will not be taken into consideration.

19. 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.

20.0 Malpractices Rules

Disciplinary Action For / Improper Conduct in Examinations

	Nature of Malpractices/Improper conduct	Punishment
	If the student:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which 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 other body language methods 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	In case of students of the college, they is expelled from examination halls and cancellation of their performance in that subject and all

	<p>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</p>	<p>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.</p>
<p>6.</p>	<p>Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.</p>	<p>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</p>

		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 student 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 award suitable punishment.*



ANNEXURE-I
J.B.INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous)

Accredited by NBA & NAAC, Approved by AICTE & Permanently affiliated to JNTUH

Yenkapally(V), Moinabad(M), P.O. Himayat Nagar, R.R. District, Hyderabad-500075

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

1. Objectives

The key objectives of offering B. Tech. with Honours program 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 of specializations.

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. program.
- 2) For B. Tech with Honours program, 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 program, 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 program to regular B. Tech. degree course & 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 program 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 program 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.

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

10) Students can register for the Honours program 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. program as well as fulfils the requirements for Honours program.

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 program offered at their respective departments without any overlap/clash with other courses of study in the respective 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 more CGPA.**
- b) **If a student fails in any registered course of either B. Tech. or Honours in any semester of four years program, he/she will not be eligible for obtaining Honours degree.** He will be eligible for only B. Tech. degree
- c) **Prior approval of mentor and Head of the Department for the enrolment into Honours program, 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 by the students till II year I semester.**
- e) Successful completion of 20 credits earmarked for honours program with at least 7.5 CGPA along with successful completion of 160 credits earmarked for regular B. Tech. Program 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 program will not be considered.

4. Registration for the course in Honours program

- 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 at the 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.



ANNEXURE-II

J.B.INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC Autonomous)

Accredited by NBA & NAAC, Approved by AICTE & Permanently affiliated to JNTUH

Yenkapally(V), Moinabad(M), P.O. Himayat Nagar, R.R. District, Hyderabad-500075

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

5. Objectives

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

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

6. Academic Regulations for B. Tech. Minors degree

- 14) The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B. Tech. program.
- 15) For B. Tech with Minors program, 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 Minors program, 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.**
- 16) 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.
- 17) There is no transfer of credits from courses of Minors program to regular

B. Tech. degreecourse & vice versa.

18) 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.

19) 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.

20) The **choice to opt/take the Minors program is purely on the choice of the students.**

21) The student shall be given a **choice of withdrawing all the courses registered and/or the credits earned for Minors program 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.

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

23) Students can register for the Minors program only if they fulfill the eligibility criteria.

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

25) The record of students registered and pursuing their Minors programs

branch-wise is sent to JNTUH once the enrolment process is complete.

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

7. 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 more CGPA.**
- h) **If a student fails in any registered course of either B. Tech. or Minors in any semester of four years program, he/she will not be eligible for obtaining Minors degree.** He will be eligible for only B. Tech. degree
- i) **Prior approval of mentor and Head of the Department for the enrolment into Minors program, 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 by the students till II year I semester.**
- k) Successful completion of 20 credits earmarked for Minors program with at least 7.5 CGPA along with successful completion of 160 credits earmarked for regular B. Tech. Program 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 program will not be considered.

8. Registration for the course in Minors program

- 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 at the 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.

B.Tech. Course Structure

I Year I Semester

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)	Approving BOS
1	L110A	Differential Equations and Calculus	3	1	0	0	4	BS	Y	Math
2	L110D	Engineering Chemistry	3	0	0	0	3	BS	Y	Chem
3	L112B	Fundamentals of Electrical circuits and Electronic Devices	3	0	0	0	3	ES	Y	EEE & ECE
4	L113A	Engineering Mechanics	3	0	0	0	3	ES	Y	Mech
5	L1131	Engineering Drawing	1	0	4	0	3	ES	Y	Mech
6	L1133	Engineering Workshop and Manufacturing Practices	1	0	4	0	3	ES	Y	Mech
7	L1103	Chemistry Lab	0	0	2	0	1	BS	Y	Chem
8	L11M1	Functional English	2	0	0	0	0	AC	Y	English
Total			16	1	10	0	20			

I Year II Semester

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)	Approving BOS
1	L120A	Linear Algebra and Advanced Calculus	3	1	0	0	4	BS	Y	Math
2	L120B	English	3	0	0	0	3	HS	Y	English
3	L120E	Engineering Physics	3	0	0	0	3	BS	Y	Physics
4	L125A	Programming for Problem Solving	3	1	0	0	4	ES	Y	CSE
5	L1202	Physics Lab	0	0	2	0	1	BS	Y	Physics
6	L1201	English Language and Communication Skills Lab	0	0	2	0	1	HS	Y	English
7	L1251	Programming for Problem Solving Lab	0	0	4	0	2	ES	Y	CSE
8	L12M2	Human Values and Professional Ethics	2	0	0	0	0	AC	Y	MBA
Total			14	2	8	0	18			

B.Tech. Course Structure

II Year I Semester

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)	Approving BOS
1	L210A	Probability and Statistics	3	1	0	0	4	BS	Y	Maths
2	L218A	Development of Mineral Deposits	3	0	0	0	3	PC	N	Mining
3	L218B	Mining Geology	3	0	0	0	3	PC	N	Mining
4	L213B	Mechanics of Solids	3	1	0	0	4	ES	Y	Mech
5	L218C	Mine Surveying - I	3	1	0	0	4	PC	N	Mining
6	L2181	Mine Surveying - I Lab	0	0	2	0	1	PC	N	Mining
7	L2182	Mining Geology Lab	0	0	2	0	1	PC	N	Mining
8	L2183	Internship-I	0	0	2	0	1	PW	Y	-
9	L21M1	Gender Sensitization	2	0	0	0	0	MC	Y	English
Total			17	3	6	0	21			

II Year II Semester

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)	Approving BOS
1	L22EA	Managerial Economics and Management Science	3	1	0	0	4	HS	Y	MBA
2	L220A	Numerical Techniques	3	0	0	0	3	BS	Y	Math
3	L228A	Mine Surveying - II	3	1	0	0	4	PC	N	Mining
4	L228B	Mine Mechanization	3	0	0	0	3	PC	N	Mining
5	L228C	Drilling and Blasting	3	0	0	0	3	PC	N	Mining
6	L228D	Underground Metal Mining Technology	3	0	0	0	3	PC	N	Mining
7	L2281	Mine Surveying - II Lab	0	0	2	0	1	PC	N	Mining
8	L22M2	Environmental Science	2	0	0	0	0	MC	Y	Civil
Total			20	2	2	0	21			

B.Tech. Course Structure

III Year I Semester

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)	Approving BOS
1	L318A	Mine Ventilation	3	1	0	0	4	PC	N	Mining
2	L318B	Mineral Processing	3	0	0	0	3	PC	Y	Mining
3	BTMIEE1	Professional Elective-1	3	0	0	0	3	PE	N	Mining
4	BTMIEO1	Open Elective-I	3	0	0	0	3	OE	N	-
5	L318C	Underground Coal Mining Technology	3	0	0	0	3	PC	N	Mining
6	L3181	Mineral Processing Lab	0	0	4	0	2	PC	N	Mining
7	L3182	Mine Ventilation Lab	0	0	4	0	2	PC	N	Mining
8	L3183	Internship-II	0	0	2	0	1	PW	Y	-
9	L31M1	Artificial Intelligence	2	0	0	0	0	MC	Y	CSE
10	L31T1	Employability Skills	2	0	0	0	0	AC	Y	English
Total			19	0	10	0	20			

III Year II Semester

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)	Approving BOS
1	L328A	Mine Economics	3	0	0	0	3	PC	N	Mining
2	L328B	Rock Mechanics	3	1	0	0	4	PC	N	Mining
3	BTMIEE2	Professional Elective-II	3	0	0	0	3	PE	Y	Mining
4	BTMIEE3	Professional Elective-III	3	0	0	0	3	PE	Y	Mining
5	BTMIEO2	Open Elective-II	3	0	0	0	3	OE	N	-
6	BTMIEO3	Open Elective-III	3	0	0	0	3	OE	N	-
7	L3201	Life Skills and Professional Skills Lab	0	0	4	0	2	HS	Y	English
8	L32M2	Cyber Security	2	0	0	0	0	MC	Y	IT
9	L32T2	Foundations of Entrepreneurship	2	0	0	0	0	AC	Y	MBA
Total			22	0	8	0	22			

B.Tech. Course Structure

IV Year I Semester

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)	Approving BOS
1	L418A	Mine Legislation	3	1	0	0	4	PC	N	Mining
2	L418B	Mine Planning and Design	3	1	0	0	4	PC	N	Mining
3	BTMIEE4	Professional Elective - IV	3	0	0	0	3	PE	Y	Mining
4	BTMIEE5	Professional Elective -V	3	0	0	0	3	PE	N	Mining
5	BTMIEO4	Open Elective-IV	3	0	0	0	3	OE	N	-
6	L4181	Rock Mechanics Lab	0	0	4	0	2	PC	N	Mining
7	L4182	Mini Project	0	0	4	0	2	PW	Y	-
8	L4183	Project Stage - I	0	0	4	0	2	PW	Y	-
Total			15	2	12	0	23			

IV Year II Semester

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)	Approving BOS
1	BTMIEE6	Professional Elective - VI	3	0	0	0	3	PE	Y	Mining
2	BTMIEO5	Open Elective - V	3	0	0	0	3	OE	N	-
3	L4281	Seminar	0	0	2	0	1	PW	Y	-
4	L4282	Project Stage - II	0	0	16	0	8	PW	Y	-
Total			6	0	18	0	15			

B.Tech. Course Structure

Professional Elective-I

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)	Approving BOS
1	L318E	Surface Mining Technology	3	0	0	0	3	PE	N	Mining
2	L318F	Sustainable Mineral Industry	3	0	0	0	3	PE	N	Mining
3	L318G	Remote Sensing and GIS in Mining	3	0	0	0	3	PE	N	Mining

Professional Elective-II

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)	Approving BOS
1	L328E	Mine Environmental Engineering	3	0	0	0	3	PE	N	Mining
2	L328F	Planning of Surface Mining Projects	3	0	0	0	3	PE	N	Mining
3	L328G	Geostatistics	3	0	0	0	3	PE	N	Mining

Professional Elective-III

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)	Approving BOS
1	L328H	Mine Health and Safety Engineering	3	0	0	0	3	PE	N	Mining
2	L328I	Advanced Mining	3	0	0	0	3	PE	N	Mining
3	L328J	Advanced Exploration Techniques	3	0	0	0	3	PE	N	Mining

B.Tech. Course Structure

Professional Elective-IV

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)	Approving BOS
1	L418E	Mine Planning and Design	3	0	0	0	3	PE	N	Mining
2	L418F	Mine Systems Engineering	3	0	0	0	3	PE	N	Mining
3	L418G	Long Wall Mining	3	0	0	0	3	PE	N	Mining

Professional Elective-V(Mandatory MOOC)

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)	Approving BOS
1	L418H	MOOC I	3	0	0	0	3	PE	N	Mining
2	L418I	MOOC II	3	0	0	0	3	PE	N	Mining
3	L418J	MOOC III	3	0	0	0	3	PE	N	Mining

Professional Elective-VI

S. No.	Code	Course Title	L	T	P	D	Credits	Category	Common Subject (Y/N)	Approving BOS
1	L428E	Mine Ground Control	3	0	0	0	3	PE	N	Mining
2	L428F	Rock Slope Engineering	3	0	0	0	3	PE	N	Mining
3	L428G	Eco – Friendly Mining	3	0	0	0	3	PE	N	Mining

* = MOOCs courses are to be decided just before the commencement of the semester, as per the availability of the said courses on the online MOOCs platforms.

B.Tech. Course Structure

R-22 Open Electives
List of Subjects offered by various Board of Studies

Open Elective-I								
S. No.	Code	Course Title	L	T	P	D	Credits	Approving BOS
1	L310A	Elements of Civil Engineering	3	0	0	0	3	CE
2	L310B	Fundamentals of Database Management Systems	3	0	0	0	3	CSE
3	L310C	Introduction to Machine Learning	3	0	0	0	3	AI&ML
4	L310D	Introduction to Data Science	3	0	0	0	3	AI&DS
5	L310E	Principles of Communications	3	0	0	0	3	ECE
6	L310F	Fundamentals of Digital Logic Design	3	0	0	0	3	ECM
7	L310G	Energy Engineering	3	0	0	0	3	EEE
8	L310H	Open Source Softwares	3	0	0	0	3	IT
9	L310I	Automotive Technology	3	0	0	0	3	MECH
10	L310J	Introduction to Mining Technology	3	0	0	0	3	MINING
11	L310K	Entrepreneurship for Micro, Small and Medium Enterprises	3	0	0	0	3	MBA
12	L310L	Numerical solutions of ODE	3	0	0	0	3	Maths
13	L310M	Nano materials	3	0	0	0	3	Physics
14	L310N	Chemistry of Engineering Materials	3	0	0	0	3	Chemistry
15	L310O	Technical writing skills	3	0	0	0	3	English
16	L310P	Indian Constitution	3	0	0	0	3	English

B.Tech. Course Structure

Open Elective-II								
S. No.	Code	Course Title	L	T	P	D	Credits	Approving BOS
1	L32OA	Construction Management, Contracts, and valuation	3	0	0	0	3	CE
2	L32OB	Principles of Operating Systems	3	0	0	0	3	CSE
3	L32OC	Introduction to Predictive Analytics	3	0	0	0	3	AI & ML
4	L32OD	Business Data Analytics	3	0	0	0	3	AI & DS
5	L32OE	Basics of IC Technology	3	0	0	0	3	ECE
6	L32OF	Introduction to Micro Processor and Micro Controllers	3	0	0	0	3	ECM
7	L32OG	Hybrid Electric Vehicles	3	0	0	0	3	EEE
8	L32OH	Distributed Systems	3	0	0	0	3	IT
9	L32OI	Fundamentals of Operations Research	3	0	0	0	3	MECH
10	L32OJ	Introduction to Surface Mining	3	0	0	0	3	MINING
11	L32OK	Intellectual Property Rights	3	0	0	0	3	MBA
12	L32OL	Numerical solutions of PDE	3	0	0	0	3	Maths
13	L32OM	Advanced physics for Engineers	3	0	0	0	3	Physics
14	L32ON	Green Chemistry	3	0	0	0	3	Chemistry
15	L32OO	Teamwork and Team Building	3	0	0	0	3	English
16	L32OP	Essence of Indian Traditional Knowledge	3	0	0	0	3	English

B.Tech. Course Structure

Open Elective-III

S. No.	Code	Course Title	L	T	P	D	Credits	Approving BOS
1	L320Q	Road Safety Engineering	3	0	0	0	3	CE
2	L320R	Introduction to Java Programming	3	0	0	0	3	CSE
3	L320S	Introduction to Neural Networks	3	0	0	0	3	AI&ML
4	L320T	Introduction to Data Science for Health Care	3	0	0	0	3	AI&DS
5	L320U	MATLAB Programming Language	3	0	0	0	3	ECE
6	L320V	Introduction to Sensors and Actuators	3	0	0	0	3	ECM
7	L320X	Non-Conventional Energy Sources	3	0	0	0	3	EEE
8	L320Y	Soft Computing	3	0	0	0	3	IT
9	L320Z	Basics of Robotics	3	0	0	0	3	MECH
10	L3201	Basic Mining Geology	3	0	0	0	3	MINING
11	L3202	Digital Marketing	3	0	0	0	3	MBA
12	L3203	Number Theory and Cryptography	3	0	0	0	3	Maths
13	L3204	NDT and Vacuum Technology	3	0	0	0	3	Physics
14	L3205	Nano Technology	3	0	0	0	3	Chemistry
15	L3206	Technical communication skills	3	0	0	0	3	English

B.Tech. Course Structure

Open Elective-IV

S. No.	Code	Course Title	L	T	P	D	Credits	Approving BOS
1	L41OA	Environmental Impact Assessment	3	0	0	0	3	CE
2	L41OB	Introduction to Python Programming	3	0	0	0	3	CSE
3	L41OC	Introduction to Deep Learning	3	0	0	0	3	AI&ML
4	L41OD	Introduction to Big data	3	0	0	0	3	AI&DS
5	L41OE	Consumer Electronics	3	0	0	0	3	ECE
6	L41OF	Introduction to Embedded Systems	3	0	0	0	3	ECM
7	L41OG	Special Electrical Machines	3	0	0	0	3	EEE
8	L41OH	Object Oriented Analysis and Design	3	0	0	0	3	IT
9	L41OI	Digital Manufacturing	3	0	0	0	3	MECH
10	L41OJ	Basics of Mine Environment	3	0	0	0	3	MINING
11	L41OK	Rural Marketing	3	0	0	0	3	MBA

B.Tech. Course Structure

Open Elective-V								
S. No.	Code	Course Title	L	T	P	D	Credits	Approving BOS
1	L42OA	Energy Audit & Green Buildings	3	0	0	0	3	CE
2	L42OB	Introduction to Big Data Analytics	3	0	0	0	3	CSE
3	L42OC	Introduction to Generative Adversarial Networks	3	0	0	0	3	AI&ML
4	L42OD	Introduction to Cloud Computing	3	0	0	0	3	AI&DS
5	L42OE	Principles of Sensors and their Application	3	0	0	0	3	ECE
6	L42OF	Introduction to Electronic Instrumentation	3	0	0	0	3	ECM
7	L42OG	Instrumentation	3	0	0	0	3	EEE
8	L42OH	Cyber Laws & Ethics	3	0	0	0	3	IT
9	L42OI	Renewable Energy Systems	3	0	0	0	3	MECH
10	L42OJ	Fundamentals to Rock Mechanics	3	0	0	0	3	MINING
11	L42OK	Customer Relationship Management	3	0	0	0	3	MBA

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year-I Sem			
Course Code: L110A	DIFFERENTIAL EQUATIONS AND CALCULUS (Common to all Branches)	L	T	P	D
Credits: 4		3	1	0	0

Pre-Requisites:

Module 1: First Order, First Degree ODE and its Applications [9L]

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 Homogeneous, non-homogeneous differential equations, non-homogeneous terms of the type e^{ax} , $\sin(ax)$, $\cos(ax)$, polynomials in x , $e^{ax} \cdot V(x)$, $xV(x)$. Method of variation of parameters, Equations reducible to linear ODE with constant Coefficients, Euler-Cauchy equation, Legendre's equation.

Module 3: Sequences and Fourier series [10L]

Definition of a Sequence, limit, Convergent, Divergent and Oscillatory sequences.

Series, Convergent, Divergent and Oscillatory Series, Series of positive terms, P-test, Comparison test, Alternating series, Leibnitz test, Absolute and Conditionally Convergence.

Determination of Fourier coefficients, Fourier series of even and odd functions, Fourier series in an arbitrary interval, even and odd periodic continuation, Half-range Fourier sine and cosine expansions.

Module 4: Calculus and Improper integrals [9L]

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

Definition of Improper Integrals, Beta functions, Properties of beta functions, Gamma functions, Properties of Gamma functions, Relation between the Gamma and Beta functions, evaluation of improper integrals using Beta and Gamma functions.

Module 5: Functions of Multivariable [10L]

Limits, Continuity, Partial differentiation, partial derivatives of first and second order, homogeneous function, Euler's theorem, total derivative, Chain rule, Jacobian, Taylor's theorem of two variables (without proof). Maxima and Minima of two variables, Lagrange's method of undetermined multipliers.

Textbooks

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, 2015.

Reference Books

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

E-Resources

1. <https://nptel.ac.in/courses/111106100>
2. <https://www.math.ust.hk/~machas/differential-equations.pdf>
3. https://en.wikipedia.org/wiki/Fourier_series
4. <https://www.khanacademy.org/math/ap-calculus-bc/bc-integration-new/bc-6-13/a/improper-integrals-review>
5. https://onlinecourses.nptel.ac.in/noc20_ma15/preview

Course Outcomes

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

CO1.Formulate and solve the First order linear differential equations.

CO2.Apply the concepts of higher order linear differential equations with constant coefficients solving physical problems arising in engineering.

CO3.Obtain Fourier series expansion of a given function.

CO4.Analyse the improper integrals.

CO5.Find the maxima and minima of multivariable functions.

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	2	3	-	-	-	-	-	-	-	3	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	3	-	-
CO3	2	2	1	1	-	-	-	-	-	-	-	2	-	-
CO4	3	3	2	1	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	2	-	-	-	-	-	-	-	2	-	-
Average	3	3	1.9	1.6	-	-	-	-	-	-	-	2.4	-	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year-I Sem			
Course Code: L110D	ENGINEERING CHEMISTRY (COMMON TO: AIML, CE, ME, ECE, EEE and MIE)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Nil

Module 1: Molecular Structure and Theories of Bonding [9L]

Atomic and Molecular orbitals- Molecular orbital theory-LCAO – bonding in homo and hetero nuclear di atomic molecules, molecular orbital energy level diagrams of homo nuclear di atomic molecules (N₂, O₂ and F₂), hetero nuclear di atomic molecules (CO and NO). Crystal Field Theory (CFT), Salient Features of CFT – Crystal Field Splitting of transition metal ion d- orbitals in Tetrahedral, Octahedral complexes. Magnetic and colour properties of complexes. Band theory of solids – band diagrams for conductors, semiconductors and insulators, effect of doping on conductance.

Module 2: Water and Its Treatment [10L]

Introduction – hardness of water – Causes of hardness - Types of hardness- temporary and permanent – units of hardness-numerical problems – Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in potable water treatment – Disinfection of water by chlorination and ozonation- Break-point chlorination. Boiler feed water- scale and sludge formation--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.

Module 3: Electrochemistry and Corrosion [12L]

Electrochemistry[7L]

Introduction-electrode potential, standard electrode potential, Electrochemical Cell-Galvanic cell –Nernst equation derivation-applications, Numerical problems. Types of electrodes – calomel, Quinhydrone and glass electrode. determination of pH of a solution by using quinhydrone and glass electrode. Electro chemical series and its applications. Batteries – Primary (Li-MnO₂ cell) and secondary batteries (Lead – acid storage battery and Lithium-ion battery).

Corrosion[5L]

Causes and effects of corrosion – chemical and electrochemical corrosion – mechanism of electrochemical corrosion, types of corrosion-galvanic, pitting and waterline corrosion-factors influencing rate of corrosion-Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods-Surface Coatings-Hot dipping (Galvanizing and Tinning).

Module 4: Chemical Fuels [8L]

Fuels: Definition, classification, characteristics of a good fuel, Calorific value (CV)-HCV and LCV. Calculation of CV using Dulong's formula, numericals.

Solid Fuels: Coal-proximate & ultimate analysis-significance.

Liquid Fuels: Composition and CV of gasoline, cracking: Fixed bed catalytic cracking method. Knocking and its significance, octane number, cetane number.

Module 5: Polymers and Nanomaterials[12L]

Polymers [8L]

Definition – Types of polymerizations – addition and condensation polymerization with examples. Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, compounding and fabrication of plastics (compression and injection moulding). Preparation, Properties and engineering applications of PVC, Nylon-6, 6 and Bakelite. Conducting Polymers-conduction in polyacetylene.

Nanomaterials[4L]

Introduction, Synthesis: Top down and bottom-up approaches. Sol-gel and Chemical Vapour Deposition (CVD) methods. Properties and applications of fullerenes, carbon nanotubes. Medical applications of nanomaterials.

Textbooks

1. Engineering Chemistry: P. C. Jain & M. Jain, Dhanpat Rai Publications, New Delhi.
2. Engineering Chemistry: Shashi Chawla, Dhanapathrai Publications (2019), New Delhi.

Reference Books

1. Engineering Chemistry, M. Thirumalachary and Laxminarayana, Scitech Publications.
2. Textbook of Engineering Chemistry, 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.** Understand and analyse microscopic chemistry in terms of atomic orbitals, molecular orbitals.
- CO2.** Recognize and select the domestic and industrial problems caused by hard water and learn about the municipal water treatment using various methods.
- CO3.** Understand and interpret the important fundamental concepts of electrochemical procedures related to corrosion and its control.
- CO4.** Rate the fuels and suggest methods for enhancement of the quality of fuels for the required output.
- CO5.** Identify & recognize the role of polymers and Nanomaterials in everyday life.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year-I Sem			
Course Code: L112B	Fundamentals of Electrical Circuits and Electronic Devices (Common to CE, ME & MIE)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Nil

Module 1: DC Circuits [10L]

Unit-I: [6L]

Electrical quantities – Electrical circuit elements - resistors - inductors - capacitors - voltage and current sources - Source transformations - Ohm's Law - Kirchhoff's Laws - simple problems.

Unit-II: [4L]

Network reduction techniques - series and parallel circuits - analysis of DC circuits - mesh, nodal - simple problems.

Module 2: AC Circuits [9L]

Unit-I: [5L]

Sinusoidal functions - phasor representation - RMS and Average values - form and peak factors.

Unit-II: [4L]

Analysis of single-phase AC circuits consisting of R, L, C, RL, RC and RLC series combinations - power and power factor-concept of three phase system.

Module 3: DIODES AND APPLICATIONS [12L]

Unit-I: UNIT 1: P-N junction diode Principle of operation and characteristics of a P-N junction diode static and dynamic resistance of a diode, ideal diode, Zener Diode, Avalanche and Zener Breakdown mechanisms, V-I characteristics of Zener Diode

Unit-II: Rectifiers & Filters Diode as a Rectifier Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Zener diode as a voltage regulator

Module 4: Bi-Polar Junction Transistor (BJT) [7L]

Unit-I: Principle of operation of Bi-Polar Junction Transistor (BJT), current components in a junction Transistor, V-I characteristics in CB, CE, CC configurations.

Unit-II: Determination of " α " and " β " of a transistor from the V-I characteristics, relation between " α " and " β " of a transistor.

Module 5: FIELD EFFECT TRANSISTER [12L]

Unit-I: Comparison of BJT & JFET, Construction & Operation of JFET, V-I Characteristics of JFET, Determination of FET Parameters from the V-I characteristics.

Unit-II: MOSFET Construction & Operation in Enhancement and Depletion modes, V-I Characteristics of MOSFET.

Textbooks

1. V.K. Mehta, "Principles of Electrical Engineering and Electronics", S. Chand & Company Ltd, 2012
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
3. A. K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", Dhanapath Rai and Sons., 10th Edition, 2007.
4. Electronic Devices & Circuits: Millman & Halkias Mcgraw Hill
5. Integrated Electronics: Millman & Halkias Mcgraw Hill

Reference Books

1. Dr. Ramana Pilla, Dr. M. Suryakalavathi, "Basic Electrical Engineering", S. Chand, 2018.
2. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

E-Resources

1. https://onlinecourses.swayam2.ac.in/nou21_ee02/preview
2. <https://nptel.ac.in/courses/108/108/108108076/>
3. <https://www.electrical4u.com>

Course Outcomes

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

- CO 1.** Analyse DC electrical circuits using network laws.
- CO 2.** Analyse single phase AC and three phase AC circuits.
- CO 3.** Understand PN junction diode operation, characteristics, and applications.
- CO 4.** Gain Knowledge on characteristics of BJT in CB, CE, CC Configuration
- CO 5.** Gain Knowledge on characteristics of FET in various modes of operation

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	1	1	-	-	-	-	-	-	1	1	1
CO2	3	2	1	1	-	-	-	-	-	-	-	1	1	1
CO3	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO4	3	3	3	2	2	-	-	-	-	-	-	2	2	2
CO5	3	3	3	2	2	-	-	-	-	-	-	2	2	2
Average	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year - I Sem			
Course Code: L113A	ENGINEERING MECHANICS (COMMON TO: ME, CE)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Engineering Physics.

Module 1: Resultant Force system and Equilibrium of Force System [12L]

Unit-I: [6L]

Concepts of force, System of forces, components of forces in a plane and in space systems. Resultant of force systems. Moment of forces and its applications. Couples and its applications

Unit-II: [6L]

Free body diagram, equation of equilibrium of coplanar and spatial force systems.

Module 2: Friction, Analysis of Trusses and Virtual Work [9L]

Unit-I: [3L]

Laws of friction, application of friction to a single body & connecting system, wedge friction

Unit-II: [3L]

Analysis of perfect trusses using method of joints and method of sections.

Unit-III: [3L]

Virtual displacements, Principle of virtual work for particle and ideal system of rigid bodies- problems on determinate beams only.

Module 3: Centroid & Centre of Gravity and Area & Mass moment of Inertia [9L]

Unit-I: [4L]

Centroid of simple planes (from first principles), Centroid of Composite sections, Centre of gravity and its implications, Pappu's theorems.

Unit-II: [5L]

Definition of Area moment of Inertia, Moment of inertia of plane section from first principles, Theorems of moment of inertia, moment of inertia of standard sections and composite sections, Mass moment of inertia of rectangular and circular plates, cylinder, cone & sphere.

Module 4: Kinematics and Kinetics [10L]

Unit-I: [5L]

Rectilinear and Curvilinear motion, Velocity and Acceleration, Types of Rigid body motion, Kinematics of fixed axis rotation and Plane Motion.

Unit-II: [5L]

Kinetics of Particle and Rigid Body in Translation, Fixed Axis Rotation, Equations of Plane Motion, Rolling Bodies.

Module 5: Work Energy Method and Mechanical Vibrations [10L]

Unit-I: [5L]

Work Energy Principle and its application to Translation, Fixed axis rotation and plane motion.

Unit-II: [5L]

Introduction to vibration, free and forced vibrations, simple harmonic motion, simple pendulum and compound pendulum.

Text Books

1. Vijaykumar K. and J. Suresh Kumar, "Engineering Mechanics Statics and Dynamics", B. S. Publications. 2011.
2. 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 and space force system, draw free body diagrams to analyze various problems in equilibrium.
- CO2.** Analyze for smooth and frictional surface, simple trusses for forces and virtual work.
- CO3.** Determine the Centroid, centre 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	PO1 0	PO1 1	PO1 2	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: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year - I Sem			
Course Code: L1131	ENGINEERING DRAWING (COMMON TO CE,EEE,ME,ECE,MIE, AIML)	L	T	P	D
Credits: 3		1	0	4	0

Pre-Requisites: Engineering Mathematics.

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

Unit-I: [2L]

Introduction to Engineering Drawings, Significance, Introduction to AutoCAD.

Unit-II: [4L]

Ellipse – Eccentric Method, Arcs Method, Concentric, Circle Method, Rectangular Method; Parabola – Eccentric Method, Rectangular Method.

Unit-III: [3L]

Cycloid – Epicycloid, Hypocycloid, Involute of Circles.

Unit-IV: [3L]

Construction of Plane, Diagonal Scales.

Module 2: Principles of Orthographic Projections, Projections of Points, Line, Planes [9L]

Unit-I: [3L]

Introduction to Orthographic Projections, Conventions.

Unit-II: [3L]

Projections of Points in four Quadrants, Projection of Lines in first quadrant, Inclined to both Principle Planes.

Unit-III: [3L]

Projections of Planes in first quadrant and inclined to both Principle Planes for Regular Geometrical Figures – Circle, Square, Rectangle, Triangle, Pentagon, Hexagon.

Module 3: Projections of Solids [8L]

Unit-I: [5L]

Projections of Right Regular Solids – Prisms and Pyramids of Square, Pentagon, Hexagon;

Unit-II: [3L]

Projections of Generated Solids – Cone, Cylinder.

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

Unit-I: [6L]

Sectional and Auxiliary Views of Right Regular Solids – Prisms and Pyramids of Pentagon, Hexagon; Generated solids – Cylinder and Cone.

Unit-II: [6L]

Surfaces of Right Regular solids – Prism, cylinder pyramid and cone

Module 5: Isometric Projections, Orthographic Views [9L]

Unit-I: [5L]

Principles of Isometric Projections, Isometric Scale, Isometric Views of Simple and Compound Solids; Conversion of Orthographic Views of simple objects to Isometric Views.

Unit-II: [4L]

Conversion of Isometric Views to Orthographic Views.

Text Books

1. Bhatt N.D., Panchal V.M. & Ingle P.R., "Engineering Drawing", Charotar Publishing House, 2014.
2. K. Venugopal & V. Prabhu Raja, "Engineering Drawing + Auto CAD", New Age International Publishers. Fifth Edition, 2011.

Reference Books

1. Narayana, K.L. & P Kanniah, "Text book on Engineering Drawing", Scitech Publish, 2008
2. Agrawal B. & Agrawal C. M., "Engineering Graphics", TMH PubIn, 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.** Equipped with the basic knowledge of using the drawing instruments and dimension practice.
- CO2.** Represent any three-dimensional object with two-dimensional drawings and exposed to the visual aspects of lines and planes.
- CO3.** Visualize of solids inclined to both the planes.
- CO4.** Visualization of sections of solids and their developments.
- CO5.** Representation of 3D objects through isometric and orthographic views

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year-I Sem			
Course Code: L1133	ENGINEERING WORKSHOP AND MANUFACTURING PRACTICES	L	T	P	D
Credits: 3	(COMMON TO CE,EEE,ME,ECE,MIE, AIML)	1	0	4	0

Pre-Requisites: Basic knowledge about tools and different trades

List of Experiments

Experiments for Practice

1. To make a Half Lap joint from the given two reapers.
2. To make a Dovetail joint from the given two reapers.
3. To make a Straight fitting from the given two MS pieces.
4. To make a V- fitting from the given two MS pieces.
5. To make a Rectangular Scoop using the given Sheet metal.
6. To make a Hooper using the given Sheet metal.
7. To perform Parallel and Series wiring connection
8. To perform stair case wiring connection
9. To prepare a sand mould for the given single piece pattern.
10. To prepare a sand mould for the given Split-piece pattern.

Demonstration

11. To make a Square rod and S- hook from a given round rod
12. To make a Lap and Butt joint using the given two M.S pieces by arc welding
13. To perform Plain and Step turning operation on lathe machine.
14. To perform Taper turning and Thread cutting operation on lathe machine.
15. To perform a simple Milling operation on given workpiece.

Text Books

1. P.N.Rao, "Manufacturing Technology", TataMcGrawHill, 4th Edition, 2013.
2. K. C. John, "Mechanical Workshop Practice", PHI Publishers, 2nd Edition, 2010.

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.** understand the basics of removal of material from workpiece surface to attain specific shape.
- CO4.** familiarize with the production of simple models in fitting, carpentry, sheet metal, machine, welding and smithy trades.
- CO5.** Gain different skills of manufacturing and importance of dimensional accuracies and dimensional tolerances in assembling of various components.

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	-	-	-	-	-	-	-	-	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: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year-I Sem			
Course Code: L1103	CHEMISTRY LAB (COMMON TO: AIML, CE, ME, ECE, EEE and MIE)	L	T	P	D
Credits: 1		0	0	2	0

Pre-Requisites: Nil

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 Fe²⁺ in Mohr's salt using permanganometry.
5. Estimation of ferrous iron by dichrometry.

Instrumental methods of Analysis:

6. Estimation of an HCl by Conductometric titrations using NaOH.
7. Estimation of Acetic acid by Conductometric titrations using NaOH.
8. Estimation of HCl by Potentiometric titrations using NaOH.
9. Estimation of Fe²⁺ by Potentiometry using KMnO₄.

Determination of Physico-Chemical Properties:

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

Synthesis of Nanomaterials, Polymers and drug molecules:

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

Textbooks

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. "Textbook of practical organic chemistry", Vogel's ,5th edition.
4. "Textbook 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 number 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: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year-I Sem			
Course Code: L11M1	FUNCTIONAL ENGLISH (Audit Course-I) COMMON TO: ALL	L	T	P	D
Credits: 0		2	0	0	0

Pre-Requisites:

Module 1: FUNCTIONAL ENGLISH [6L]

Introduction - Functional Spoken English; Listening – Speaking: Do’s and Don’ts; Expressing: Ability/ Admiration/ Agreement/ Anger/ Annoyance/ Appreciation/ Pleasure/ Sarcasm/ Satisfaction/ Surprise/ Approval/ Capability/ Certainty/ Condolences/ Doubt/ Fear/ Gratitude/ Possibility/ Worry; Asking for: Advice/ Clarification/ Direction/ Information/ Permission/ Predictions/ Recommendation.

Module 2: VOCABULARY BUILDING [6L]

Vocabulary for Day-to-day Conversations; Introduction: Vegetables/ Groceries/ Fruits/ Weather; Parts of Human body/ Dresses/ Furniture/ Relations; Birds/ Cries of Animals; Food/ Hospitality/ Houses/ Rooms/ Tools; Airport/ News Paper/ Books/ Gems; Corporate Vocabulary/ Jobs/ Occupations; Diseases; Slang Words and Technical Jargon.

Module 3: FUNCTIONAL GRAMMAR - I [6L]

Introduction: Parts of Speech; Verb Forms; Phrases and Clauses; Tenses; Speeches; Voices; Degrees of Comparison; Simple, Complex and Compound Sentences.

Module 4: FUNCTIONAL GRAMMAR - II [6L]

Sentence Making for Effective Communication; Sentence Structure – ‘Wh’ Questions - How to Frame Questions and Give Answers; Question Tags; Spotting Errors.

Module 5: COMMUNICATION SKILLS [6L]

Polite, Courteous and Diplomatic Terms; Useful Daily Expressions; Courtesy, Good Manners and Etiquettes; Conversation Techniques; Story Telling.

Textbooks

1. L. Adinarayana and V. Prakasam, *Spoken English*, Neelkamal Publications Pvt. Ltd., New Delhi, 2008.
2. Ram Bhasker Raju, *The Complete Book on Spoken English*, Goutham Buddha Publications, Hyderabad, 2002.

Reference Books

1. Sabina Pillai, *Spoken English for My World*, Oxford University Press, New Delhi, 2016.
2. K. R. Lakshminarayanan, *Speak in English*, Scitech Publications, Chennai, 2009.

E-Resources

1. <https://www.britishcouncil.in/programmes/english-partnerships/state/skills-projects/AP-English-Skills>.
2. <https://www.fluentu.com/blog/english/websites-to-learn-english/>

Course Outcomes

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

- CO1.** Demonstrate knowledge of grammar and vocabulary in writing effective formal letters and e-mails.
CO2. Communicate effectively by applying appropriate speaking and writing techniques by examining and applying functional English.
CO3. Learn the transformation of sentences and use them effectively.
CO4. Understand making small sentences and use them in daily colloquial situation.
CO5. Learn the useful communication expression and use them in day-to-day life.

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	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: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year-II Sem			
Course Code: L120A	Linear Algebra and Advanced Calculus (Common to all Branches)	L	T	P	D
Credits: 4		3	1	0	0

Pre-Requisites:

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

Types of Matrices, Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian, orthogonal matrices, Unitary Matrices, 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 and Quadratic Forms [12L]

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

Definitions of 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 3: Multiple Integrals [10L]

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

Applications: Finding areas and volumes, centre of gravity.

Module 4: vector differential calculus [8L]

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 [8L]

Line, surface and volume integrals.

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

Textbooks

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, 2015.

Reference Books

1. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, LaxmiPublications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 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 Outcomes

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

- CO1.** Solve the consistent system of linear equations.
- CO2.** Apply orthogonal congruent Transformations to a quadratic form.
- CO3.** Evaluate multiple integrals in various coordinate system.
- CO4.** Apply the concept of gradient, divergence and curl to formulate engineering problems.
- CO5.** Convert line integrals to surface integrals and surface integrals to volume integrals.

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	1	3	-	-	-	-	-	-	-	2	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	3	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	3	-	-
CO4	3	3	1	3	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	3	-	-
Average	3	3	1.6	3	-	-	-	-	-	-	-	2	-	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year-II Sem			
Course Code: L120B	ENGLISH (Common to CE, EEE, ME, ECE, MIE & AIML)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

Module 1: [8L]

The Model Millionaire-Oscar Wilde from the prescribed textbook 'Forging Ahead' published by Orient Black Swan.

Listening: The Listening Process-Hearing and Listening; Types of Listening.

Speaking: Narrating Personal Experiences, Expressing Opinions.

Reading: Reading for Summarizing and Paraphrasing, Facts versus Opinions.

Writing Skills: Note-making, Summarizing; Writing Formal Letters.

Vocabulary and Grammar: Subject-Verb Agreement, Noun-Pronoun Agreement; Collocations.

Module 2: [8L]

The Lotos-Eaters (extract)-Alfred Tennyson from the prescribed textbook 'Forging Ahead' published by Orient Black Swan.

Listening: Listening for Style-Communicative Purpose, Degree of Formality, Choice of Vocabulary Pronunciation and Syntax; Listening for Structure-Introduction, Body and Conclusion.

Speaking: Making Presentation-Preparing a Presentation, Structuring Content, Delivering the Presentation.

Reading: Reading for Meaning; Reading for Pleasure; Making Inferences; Reading Between the Lines.

Writing Skills: Writing an Appreciation of a Poem; Paraphrasing; Note-Taking.

Vocabulary And Grammar: Word Roots and Affixes; Tenses; Correcting Errors in Punctuation.

Module 3: [8L]

Continuous Transformation-Azim Premji from the prescribed textbook 'Forging Ahead' published by Orient Black Swan.

Listening: Listening with a Purpose-Barriers to Listening.

Speaking: Agreeing and Disagreeing with and Defending Opinions.

Reading: Reading Methods-SQ3R Reading Technique.

Writing Skills: Writing Argumentative Essays.

Vocabulary and Grammar: Active and Passive Voice, Academic Vocabulary.

Module 4: [8L]

Steve Jobs-Steven Paul Jobs from the prescribed textbook 'Forging Ahead' published by Orient Black Swan.

Listening: Effective Listening Strategies-Ten Thumb Rules for Good Listening.

Speaking: What is a Group Discussion? GD Strategies-Type of GDs-Dos and Don'ts.

Reading: Reading Strategies-Scanning and Skimming Skills.

Writing Skills: Writing Job Application Letters and CVs.

Vocabulary and Grammar: Phrasal Verbs, Phrasal Prepositions; Technical Vocabulary.

Module 5: [8L]

How I Became a Public Speaker (extract) – George Bernard Shaw from the prescribed textbook 'Forging Ahead' published by Orient Black Swan.

Listening: Listening for Explicit and Implicit Information.

Speaking: Making Presentations as a Team.

Reading: Reading Strategies-Extensive and Intensive Reading Skills.

Writing Skills: Report Writing-Formats of Reports, Types of Reports.

Vocabulary and Grammar: Improving Vocabulary-Avoiding Cliches, Redundancies; Correcting Common Errors.

Textbooks

1. Chitra. V.B. G.M. Sundaravalli, D.S. Kesava Rao. Ed. *Forging Ahead A Course Book for B. Tech Students*: Orient Black Swan: Hyderabad, 2022.
2. Ashraf Rizvi. M. *Effective Technical Communication*. McGraw-Hill: New Delhi, 2010.

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://poemanalysis.com/alfred-tennyson/the-lotos-eaters/>
2. <https://degmateng.wordpress.com/2019/11/27/lis-6-the-model-millionaire-oscar-wilde-summary/>
3. https://www.google.com/search?q=Continuous+Transformation-+Azim+Premji+&rlz=1C2CHBD_enIN915IN915&sxsrf=APq-WBs4xyvTdVhFoCE_EIk0ydf4s65pmw%3A1650947439347&ei=b3VnYo7IFJqf4-EP9fqTIA&ved=0ahUKewjO2Ki98rD3AhWazzgGHXX9BAQQ4dUDCA4&uact=5&oq=Continuous+Transformation-+Azim+Premji+&gs_lcp=Cgdnd3Mtd2l6EAMyBQghEKABMgUIIRCgATIFCCEQoAFKBAhBGABKBAhGGABQAFgAYLs1aAFwAXgAgAHyAYgB8gGSAQMyLTGYAQcGgAQKqAQHAAQE&scient=gws-wiz
4. <https://www.britannica.com/biography/Steve-Jobs>
5. <http://kjtenglishnotes.blogspot.com/2015/10/how-i-became-public-speaker.html>
6. <https://www.learngrammar.net/english-grammar>

Course Outcomes

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

- CO1.** Use English Language effectively in spoken and written forms.
- CO2.** Comprehend the given texts and respond appropriately.
- CO3.** Use the proper vocabulary and grammatically correct sentences.
- CO4.** Communicate confidently in various contexts and different cultures.
- CO5.** Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

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	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: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year- II Sem			
Course Code: L120E	ENGINEERING PHYSICS (COMMON TO CE, ME & MIE)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Fundamentals of Physics.

Module -1: Wave Optics [9L]

Interference: Principle of Superposition, coherence, and methods to produce coherent sources, interference in thin film by reflected light, Newton's Rings.

Diffraction – Distinction between Fraunhofer and Fresnel Diffraction, Fraunhofer diffraction due to single slit, Plane Diffraction Grating, resolving power of Grating.

UNIT-III: Polarization: Introduction, Polarization by reflection, Polarization by double refraction.

Module -2: Waves and Oscillations [9L]

Simple harmonic Oscillator, damped harmonic oscillator, types of damping – heavy, critical and light damping, energy decay in a damped harmonic oscillator, relaxation time, quality factor, Forced harmonic Oscillator, electrical and mechanical analogy for a simple oscillator. Torsional Pendulum and Compound Pendulum.

Module-3: Crystal Structures, Crystal Planes and X-Ray Diffraction [9L]

Crystal Structures, Crystal Planes: Space lattice, Unit cell, Lattice parameters, Crystal systems, Bravais lattices, Coordination number, atomic packing fraction, Structures and Packing fractions of Simple Cubic, Body Centered Cubic, Face Centered Cubic crystals. Crystal planes and Directions, Miller Indices for Crystal planes, Inter planar spacing of orthogonal crystal systems.

X-Ray Diffraction: Diffraction of X-rays by crystal planes: Bragg's law, Powder method, Applications of X-ray diffraction.

Module-4: Lasers & Fiber Optics [9L]

Lasers: Introduction, absorption, spontaneous emission, Stimulated emission, calculation of Einstein co-efficient of A & B, Population inversion, Pumping, Lasing action, Types of Lasers: Ruby laser, He-Ne laser, Semiconductor laser, Applications of laser.

Fibre Optics: Principle and construction of an optical fibre, Acceptance angle, Numerical aperture, Types of optical fibres (Single mode, multimode, step index, graded index), Losses in optical fibres, Optical fibre communication system with block diagram and Applications of optical fibres.

Module-5: Dielectric and Magnetic Properties [9L]

Dielectric Properties: Electric dipole, dipole moment, dielectric constant, polarizability, electric susceptibility, displacement vector, electronic, ionic and orientation polarizations (quantitative treatment), Internal fields in a solid, Clausius-Mossotti equation, Ferroelectricity and Piezo electricity.

Magnetic Properties: Basic definitions, origin of magnetic moment, Bohr magneton, classification of Dia , Para and Ferro magnetic materials on the basis of magnetic moment, domain theory of Ferro magnetism on the basis of hysteresis curve.

Textbooks

1. Engineering Mechanics, 2nd ed.- MK Harbola, Cengage Learning.
2. Engineering Physics, Gaur and Gupta, McGraw Hills.
3. " Optics" , Ajoy Ghatak, McGraw Hill Education, 2012A textbook of Engineering Physics.

Reference Books

1. "The physics of vibrations and waves", H. J. Pain, Wiley, 2006.
2. "Principles of Lasers", O.Svelto.
3. "Introduction to Mechanics", M.K.Verma, Universities Press.
4. P.K.Palanisamy, "Engineering Physics", SciTech Publications, Fourth edition.

E-Resources

1. http://www.gistrayagada.ac.in/gist_diploma/PHYSICS-StudyMaterial.pdf
2. <http://www.faadooengineers.com/threads/3300-Applied-Physics-Ebooks-pdf-freedownload?s=1b6cb6b1de4e7152298bd9d60156cd11>
3. <http://www.springer.com/physics/journal/340>
4. <http://nptel.ac.in/courses/115101005/1>
5. <http://nptel.ac.in/courses/115106061/1>

Course Outcomes

On completion of the course, the students will be able to:

1. Interpret the intensity variation of light due to interference and diffraction
2. Distinguish free, damped, and forced vibrations.
3. Analyse the bonding scheme and its physical properties of a given material
4. Analyse working principle of lasers and to summarize its applications.
5. Explain the principles of physics in dielectrics, magnetic materials useful to engineering applications.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year- II Sem			
Course Code: L125A	PROGRAMMING FOR PROBLEM SOLVING	L	T	P	D
Credits: 4		3	1	0	0

Pre - Requisites: Mathematical Knowledge, Analytical Skills.

Module-1: INTRODUCTION TO PROGRAMMING: [11L]

Unit 1: Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems.

Unit 2: Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming.

Unit 3: Introduction to C Programming Language: 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

Unit 4: 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, switch-case, 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 [9L]

Unit 1: Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays.

Unit 2: Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings

Unit 3: Structures: Defining structures, initializing structures, unions, Array of structures.

Unit 4: Preprocessor: Commonly used Preprocessor commands like include, define, undef, If, ifdef, ifndef.

Module-3: POINTERS AND FILE HANDLING IN C [10L]

Unit 1: Pointers: Idea of pointers, defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self-referential structures in linked list (no implementation) Enumeration data type.

Unit 2: 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 [10L]

Unit 1: 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.

Unit 2: 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.

Module-5: INTRODUCTION TO ALGORITHMS [10L]

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

Text Books

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 of India.
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's Outline of Programming with C, McGraw-Hill

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%20EngineeringSandipFundamentals_of_C.pdf
6. http://cs.indstate.edu/~cbasavaraj/cs559/the_c_programming_language_2.pdf

Course Outcomes

On completion of the course, the students will be able to:

1. Design the algorithms/flowcharts of C-programs.
2. Write the Code and test a given logic in C programming language.
3. Decompose a problem into functions and to develop modular reusable code.
4. Make Use of arrays, pointers, strings and structures to write C Programs.
5. Apply searching and sorting algorithms.

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	2	-	-	-	-	-	-	-	-	-	1	2	2
CO2	2	2	3	2	2	-	-	-	-	-	-	-	2	-
CO3	3	2	2	-	-	-	-	-	-	-	-	1	-	3
CO4	3	2	2	2	-	-	-	-	-	-	-	1	-	3
CO5	3	2	2	-	-	-	-	-	-	-	-	1	2	3
Avg	2.8	2.0	2.3	2.0	2.0	-	-	-	-	-	-	1.0	2.0	2.8

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year-I & II Sem			
Course Code: L1202	PHYSICS LABORATORY (COMMON TO: All branches)	L	T	P	D
Credits: 1		0	0	2	0

Pre-Requisites: Intermediate 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. LASER

To study the Wavelength of LASER Source.

8. Dielectric Constant

To determine the Dielectric constant of the given material.

9. LCR Circuit

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

10. R-C Circuit

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

11. Melde's Experiment

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

12. Torsional Pendulum

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

13. Newton's Rings

To determine the radius of curvature of the lens by forming Newton's rings.

14. Diffraction Grating

To determine the number of lines per inch of the grating.

15. Sonometer

To determine the frequency of AC Supply sonometer.

Note: Any 10 experiments are to be performed.

Textbooks

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 Electronic 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 fibre optics enable the students to apply to various systems like communications solar cell, photocells and so on.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year-II Sem			
Course Code: L1201	ENGLISH LANGUAGE COMMUNICATION SKILLS (Common to CE, EEE,ME,ECE,MIE & AIML)	L	T	P	D
Credits: 1		0	0	3	0

Pre-Requisites: Nil

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

- a) Computer Assisted Language Learning (CALL) Lab:
- b) Interactive Communication Skills (ICS) Lab:

Module 1: [9L]

CALL Lab:

Introduction to Phonetics – Speech Sounds – Vowels and Consonants, Minimal Pairs, Pronunciation Patterns.

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.

Module 3: [9L]

CALL Lab:

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

ICS Lab:

Presentations Skills-Formal Presentations.

Module 4: [9L]

CALL Lab:

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

ICS Lab:

Group Discussion skills-mock GDs

Module 5: [9L]

CALL Lab:

Listening for Specific Details-Listening Comprehension Tests.

ICS Lab:

Interview Skills-Mock Interviews.

Textbooks

1. ELCS Lab Manual: A Workbook for CALL & ICS Lab Activities; Prepared for JNTUH; 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.html>
5. <https://www.learngrammar.net/english-grammar>

Course Outcomes

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

- CO1.** Use English Language effectively in spoken and written forms.
- CO2.** Comprehend the given texts and respond appropriately.
- CO3.** Use the proper vocabulary and grammatically correct sentences.
- CO4.** Communicate confidently in various contexts and different cultures.
- CO5.** Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

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	-	-
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: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year-II Sem			
Course Code: L1251	PROGRAMMING FOR PROBLEM SOLVING LAB	L	T	P	D
Credits: 2		0	0	4	0

Pre - Requisites: Mathematical Knowledge, Analytical Skills.

List of 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 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.

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:

The student will be able to:

1. Formulate the algorithms for simple problems
2. Examine syntax errors as reported by the compilers
3. Define and manipulate data with arrays, strings, and structures
4. Make use of pointers with different function types
5. Create, read, and write to and from simple text and binary files

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	2	-	-	-	-	-	-	2	-	-	-	-	2
CO2	3	2	-	-	-	-	-	-	2	-	-	-	-	2
CO3	3	2	-	-	-	-	-	-	2	-	-	-	-	2
CO4	3	2	-	-	-	-	-	-	2	-	-	-	-	2
CO5	3	2	-	-	-	-	-	-	2	-	-	-	-	2
Average	3.0	2.0	-	-	-	-	-	-	2.0	-	-	-	-	2.0

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year-II Sem			
Course Code: L12M2	HUMAN VALUES & PROFESSIONAL ETHICS (AUDIT COURSE - II)	L	T	P	D
Credits: 0		2	0	0	0

Pre-Requisites: Nil

Module 1:

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 fulfilment of aspirations of every human being with their correct priority.

Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Module 2:

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 3:

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 4:

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 5:

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 and eco- 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 Engineering Students, Smart Student Publications, 3rd Edition.

Reference Books

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Susan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991

E-Resources

1. Value Education website, <http://www.uptu.ac.in> Story of Stuff, <http://www.storyofstuff.com>
2. Al Gore, An Inconvenient Truth, Paramount Classics, USA Charlie Chaplin, Modern Times, United Artists, USA
3. IIT Delhi, Modern Technology – the Untold Story

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	2	3	1	3	1	-	-	-	-	-	-	-	-	-
CO2	3	3	2	3	2	-	-	-	-	-	-	-	2	-
CO3	1	2	1	2	1	-	-	-	-	-	-	-	-	-
CO4	1	2	1	2	1	-	-	-	-	-	-	-	-	1
CO5	3	1	1	1	1	-	-	-	-	-	-	-	1	1
Average	2	2.2	1.2	2.2	1.2	-	-	-	-	-	-	-	1.5	1

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE II Year-I Sem			
Course Code: L210A	Probability And Statistics (Common to CE,CSE, IT, ECM, MIE,AI&ML & AI&DS)	L	T	P	D
Credits: 4		3	1	0	0

Pre-Requisites:

Module 1: Single Random variables [10L]

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

Module 2: Probability Distributions [12L]

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

Module 3: Correlation & Regression Sampling Distributions [10L]

Correlation: Types of correlation, coefficient of correlation, the rank correlation, Covariance of two random variables. Regression- Regression coefficient, the lines of regression.

Sampling: Definitions of population, sampling, statistic, and parameter. Types of sampling, Expected values of Sample mean and variance, sampling distribution, Standard error, Sampling distribution of means, sampling distribution of variance and sampling distribution of proportions, Parameter estimation- Point estimation and interval estimation.

Module 4: Testing of Hypothesis-I [8L]

Testing of hypothesis: Null hypothesis, Alternate hypothesis, Type I& Type II errors – critical region, confidence interval, and Level of significance. One sided test, two-sided test.

Large sample tests:

- (i) Test of Equality of means of two samples, equality of sample mean, and population mean (cases of known variance & unknown variance, equal and unequal variances)
- (ii) Tests of significance of difference between sample S.D and population S.D.
- (iii) Tests of significance difference between sample proportion and population proportion, difference between two sample proportions.

Module 5: Testing of Hypothesis-II [8L]

Student t-distribution, its properties and applications, test of significance sample mean, and population mean, difference between means of two small samples. Snedecor's F- distribution and its properties. Test of equality of two population variances. Chi-square distribution, its properties, Chi-square test of goodness of fit, Chi-square test for independence & applications of attributes.

Textbooks

1. S.C.Gupta and V.K.Kapoor : Fundamentals of Mathematical Statistics, 2006
2. Kantiswarup, P.K.Gupta and Manmohan Singh : Operations Research, S.Chand & Co, 2010

Reference Books

1. R. A. Johnson: Miller and Freund's Probability and Statistics for Engineers, Pearson Publishers, 9th Edition, 2017
2. Freund: Modern elementary statistics, PHI, 2006
3. Probability and Statistics for Engineers by Richard Arnold Johnson, Irwin Miller and John E. Freund, New Delhi, Prentice Hall

E-Resources

1. <https://nptel.ac.in/courses/111/108/111108098/>
2. https://en.wikipedia.org/wiki/Probability_distribution
3. <http://www.randomservices.org/random/sample/Covariance.html>
4. [https://www.nptel.ac.in/content/storage2/courses/103106120/Lecture Notes/Lec3_1.pdf](https://www.nptel.ac.in/content/storage2/courses/103106120/Lecture_Notes/Lec3_1.pdf)
5. <https://www.smartbugmedia.com/blog/hypotheses-worth-testing-on-your-website>

Course Outcomes

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

- CO1.** Understand the concept of probability and statistics
- CO2.** Find the mean and variance of a given probability distribution
- CO3.** Find the coefficient of correlation and lines of regression.
- CO4.** Test the hypothesis for large samples.
- CO5.** Test the hypothesis for small samples

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	2	-	-	-	-	-	-	-	1	-	-
CO2	3	1	2	2	-	-	-	-	-	-	-	1	-	-
CO3	3	1	2	2	-	-	-	-	-	-	-	1	-	-
CO4	3	1	2	2	-	-	-	-	-	-	-	1	-	-
CO5	3	1	2	2	-	-	-	-	-	-	-	1	-	-
Average	3	1	2	2	-	-	-	-	-	-	-	1	-	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE II Year-I Sem			
Course Code: L218A	DEVELOPMENT OF MINERAL DEPOSITS	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Nil

Course Objectives

This course will enable students to:

1. Understand the distribution of mineral deposits in India and & introduction to mining methods.
2. Understand drilling and blasting for development of mineral deposits by underground and opencast mining methods.
3. Understand supporting system in underground mines.
4. Understand how to access a mineral deposit by shafts.
5. Understand shaft sinking, piling, caisson, freezing and cementation.

Module 1

Unit I: Introduction to Mining: Distribution of mineral deposits in India and other countries, mining contributions to civilization, mining terminology, stages in the life of the mine, introduction to underground and surface mining methods.

Module 2

Unit I: Drilling: Introduction to drilling, factors affecting drilling, types of drilling, Drillability, mechanics of drilling, directional drilling, and drilling equipment – selection, their merits, demerits and limitations. Different drilling patterns, Core recovery-core barrels.

Unit II: Blasting: Fundamentals of Explosive and blasting mechanism, techniques-Primary and Secondary blasting, Solid blasting. Different types of explosives-their applications. Accessories in blasting – Detonators, safety fuse, detonating fuse, non-el, relays, exploder etc.

Module 3

Unit I: Mine Supports: Necessity, Objectives and limitations of mine supports, materials used for supports. Friction and hydraulic props, Roof bolts, chock supports.

Unit II: Roadway support, face supports, side supports, junction supports, supports in special conditions, setting and withdrawal of supports, systematic supporting.

Module 4

Unit I: Mine Development: Modes of entry into deposits for underground mining- shafts, inclines, adit setc – their fields of applications. Drivage of drifts, organization and cycle of operations, modern methods of drifting and tunnelling, road headers, tunnel boring machine.

Module 5

Unit I: Shafts: Location of shaft, shape and size, incline and vertical shafts. Surface arrangements for sinking shafts, tools and equipment, ordinary methods of sinking, drilling, blasting, removal of debris and water, ventilation and lighting, temporary and permanent lining.

Unit II: Widening and deepening of shafts, special methods of shaft sinking, piling, caisson, freezing and cementation method of shaft sinking. Modern techniques of shaft sinking.

Textbooks

1. Introductory mining engineering- Wiley India (P) Ltd, Howard L. Hartman, Jan M.Mutmansky.
2. Elements of mining technology Vol-I - D.J. Deshmukh

Reference Books

1. Principles & Practices of Coal Mining, R.D. Singh
2. Roy Pijush Pal, Blasting in ground excavations and mines, Oxford and IBH, 1sted 1993
3. C.P. Chugh, Drilling technology handbook, Oxford and IBH, 1st edition, 1977

E-Resources

1. <http://www.altu.eu/commodities/mining-technology/surface-mining/long-distancebeltconveyors/>
2. Indian Mining Journal

Course Outcomes

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

- CO1** Know the status and significance of mining Industry.
- CO2** Apply different methods of Shaft sinking according to the ground conditions.
- CO3** Know about Development of workings.
- CO4** Know about different types of supports, their advantages, and disadvantages.
- CO5** Know about different tunnelling methods.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE II Year-I Sem			
Course Code: L218B	MINING GEOLOGY	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Nil

Course Objectives

This course will enable students to:

1. To Introduce about the economics of geology
2. To learn about processes and formation of ore deposits
3. To learn about occurrence and distribution of important metallic & non-metallic mineral deposits in India
4. To learn about formation of some fossil fuels like coal, petroleum & occurrence of radioactive minerals in India.
5. To Introduce about the economics of geology

Module 1

Unit I: Structural Geology: Definition and scope-Primary and secondary structures: Bedding, lineation, foliation, cleavage, Attitude of beds, Strike, and dip of formation. Description and recognition of major structural elements **Folds:** Introduction, parts of folds. Nomenclature of folds: Folds: Anticline, Syncline, Symmetrical fold, asymmetrical fold, overturn fold, recumbent fold, Isoclinal fold, homoclinal fold, closed and open folds, drag folds.

Unit II: Unconformities: Introduction, Kinds of unconformities, recognition of unconformities. Joints: Introduction, definition, Geometrical classification of Joints. Faults: Introduction, general Characteristics, translational and rotational movements, relative movements, normal and reverse faults. Throw and Heave. Types of faults: Dip Fault, strike fault, diagonal/oblique fault, bedding fault, parallel fault, step fault. Horst and Graben.

Module 2

Unit I: Economic Geology: Aim and scope of economic geology: Definition of ore and gangue. Simple ore, complex ores, tenor, and grade of ore.

Unit II: Processes and formation of ore deposits: Syngenetic deposits, epigenetic deposits. Secondary mineral deposits: Oxidation and supergene enrichment deposits, - Mechanical concentration deposits, residual/concentration deposits.

Module 3

Unit I: Occurrence and distribution of important metallic mineral deposits in India: Iron-Copper - Lead and Zinc - Manganese - Aluminium - Chromium.

Unit II: Occurrence and distribution of important non-metallic mineral deposits in India: Asbestos - kyanite - Sillimanite

Module 4

Unit I: Coal: Origin and formation, Distribution of important coal fields in India.

Unit II: Petroleum: Origin, migration, and accumulation of petroleum. Reservoir and caprocks. Structural and stratigraphic traps. Distribution of oilfields in India. Occurrence and distribution of radioactive minerals in India: Uranium, Thorium, and beryllium.

Module 5

Unit I: Guides for locating ore deposits: a) Physiographic b) Mineralogical c) Lithological d) Stratigraphical and e) structural methods of prospecting. Geological, Geochemical, and geophysical prospecting.

Unit II: Ground Water: Introduction, Hydrological Cycle, origin and occurrence of ground water, vertical distribution ground water, water table. Aquifers: Types of aquifers, confined and unconfined aquifers, perched aquifers. Porosity and permeability of rocks, Darcy's law, experimental verification of Darcy's law. Determination of hydraulic conductivity: Laboratory methods and Tracer Tests and Auger hole Tests.

Textbooks

1. Structural Geology – Billings, M.P. Prentice Hall.
2. Economic Mineral Deposits - By Batman, John Wiley & Sons.

Reference Books

1. Economic Mineral Deposits – By Jensen M.L and Batman A.M, John Wiley & Sons.
2. A Textbook of Geology: Mukherjee P.K., The World Press Pvt. Limited Calcutta.
3. Ground Water Hydrology – By David Keith Todd, Wiley India

E-Resources

1. <http://dmg.kerala.gov.in/>
2. <http://www.mininggeology.ausimm.com.au/>

Course Outcomes

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

- CO1** Understand the fundamentals of structure geology and its well acquainted with its terminology.
- CO2** Get knowledge about economic geology and process of formation of mineral deposits.
- CO3** Get the knowledge about different formations of ore
- CO4** Distinguish metallic and non-metallic minerals
- CO5** Get knowledge about formation of fossil fuels and occurrence of radioactive minerals

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE II Year-I Sem			
Course Code: L213B	MECHANICS OF SOLIDS	L	T	P	D
Credits: 4		3	1	0	0

Pre-Requisites: Engineering Physics, Engineering Mechanics

Course Objectives

This course will enable students to:

1. Understand Material properties and relationship between them.
2. Student will acquire knowledge in drawing bending and shear force diagrams of beams of various loads and configurations.
3. Acquire sufficient knowledge about Flexural Stresses, Theory of simple bending, Determination bending stresses and section modulus, Design of simple beam sections. Learn the Shear Stresses & Shear stress distribution across various beams sections: rectangular, circular, triangular, etc.
4. Understand thoroughly the concepts of principal stresses applied to solid structural members and Mohr's circle diagram and understand the topics of thin seamless cylindrical shells, longitudinal and circumferential stresses and strains, thin spherical shells, Thick Cylinders, and Compound cylinders.
5. Study in detail about Pure torsion of Circular Shafts, Torsional moment of resistance, and Design of shafts according to various theories of failure and Student becomes familiar with methods of evaluation of deflection of beams of various configurations

Module 1

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

Module 2

Shear Force and Bending Moment diagrams: 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

Unit 1: Flexural stresses: Theory of simple bending – Assumptions – Derivation of bending equation, Determination bending stresses – Section modulus of rectangular and circular (Solid and Hollow) sections.

Unit 2: Shear Stresses: Distribution of shear stresses in rectangular, I-section, T-section, solid and hollow circular sections.

Module 4

Unit 1: Deflection of Beams: 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 2: Torsion: 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.

Module 5

Unit 1: Principal Stresses and Strains: Introduction –Stresses on an inclined section of a bar under axial loading, compound stresses, Normal and tangential stresses on an inclined plane for biaxial stresses –Two perpendicular normal stresses accompanied by a state of simple shear Mohr's circle of stresses, Principal stresses, and strains – theories of failures.

Unit 2: Thin and Thick Cylinders: 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

Textbooks

1. R.S. Kurmi and Gupta, "Strength of materials".
2. Popov, "Solid Mechanics".
3. W.A. Nash, "Strength of Materials", Tata McGraw Hill Publishers

Reference Books

1. Jindal, "Strength of Materials", Umesh Publications.
2. H. J. Shah and S. B. Junnarkar, "Mechanics of Structures", Charotar Publishing House Pvt. Ltd. Vol – I.
3. S. S. Rattan, "Strength of Materials", Tata McGraw Hill

E-Resources

1. <https://rb.gy/j4ja0h>
2. <https://rb.gy/ydbalp>
3. <https://nptel.ac.in/courses/112/102/112102284/>

Course Outcomes

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

- C01 Predict** mechanical behaviour of the member by determining the stresses, strains and deflections produced by the various loads
- C02 Draw** shear force and bending moment diagrams for statically determinate beam due to various types of loads and evaluate slope and deflection of statically determinate beams by the various loads
- C03 Apply** the concept of theory of bending and solve numerical problems across various beam sections like rectangular, circular, triangular etc.
- C04 Apply** the concepts of different types of stresses and strains in the design of simple beam sections, shafts,
- C05 Solve** numerical problems to determine the torsional moments in shaft and to design shafts according to various theories of failure, and apply the concept of thick and thin cylinders

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE II Year-I Sem			
Course Code: L218C	MINE SURVEYING-I	L	T	P	D
Credits: 4		3	1	0	0

Pre-Requisites: Nil

Course Objectives

This course will enable students to:

1. To introduce students about basics of surveying.
2. To familiarize the students with levelling & contouring
3. To introduce students about determination of area and volumes
4. To acquaint student with theodolite operation and application in surveying
5. To learn about various surveying instruments for surveying

Module 1

Unit I: Overview of Plane Surveying (Chain, compass, and plane table), Objectives, Principles and classifications, use of Field Books.

Unit II: Distance and Directions: Distance measurements conventions and methods. Use of chain and compass, electronic distance measurements, meridians, Azimuths and Bearings, declination, computation of angles.

Module 2

Unit I: Levelling: Levelling Instruments – component parts, Temporary and Permanent adjustments – methods of levelling – Fly levelling, Differential levelling, Reciprocal levelling. **Unit II:** Contouring: Characteristics and uses of contours, methods of conducting contour surveys – their plotting, contour gradient.

Module 3

Unit I: Areas from field notes, computation of Areas along irregular boundaries and regular boundaries.

Unit II: Embankments and cuttings, determination of capacity of reservoir, volume of borrow pits.

Module 4

Unit I: Theodolite – description – parts, Temporary and Permanent Adjustments, Measurement of horizontal and vertical angles, Principles of Electronic Theodolite, Trigonometric levelling

Module 5

Unit I: Traversing: Principles of Traversing, open traverse and closed traverse using chain /compass / Theodolite, Plotting and its methods. Closing error-adjustments, different corrections- axis method, Bowditch method, graphical method, Transit method.

Unit II: Triangulation: Principles of triangulation survey, procedure of triangulation, Base line measurement.

Textbooks

1. Surveying – Theory and Practice by S.S. Bavikatti
2. Mine Surveying Vol.1,2 & 3 By S. Ghatak

Reference Books

1. Arthur R. Benton and Philip J Taetly, Elements of Plane Surveying, McGraw Hill-2000
2. Arora K R Surveying Vol 1 & 2 & 3, Standard Book House, Delhi, 2004.
3. Chandra A M, Plane Surveying, New age International Pvt. Ltd., Publishers, NewDelhi, 2002.

E-Resources

1. <http://www.ism-minesurveying.org/mine-surveying.html>
2. <http://www.minesurveyor.net/>
3. <http://www.pobonline.com/articles/84226-underground-surveying>

Course Outcomes

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

- C01** Understand the fundamentals of surveying
- C02** Understand the fundamentals of levelling and contouring
- C03** Calculate areas and volumes of pits
- C04** Get knowledge about theodolite
- C05** Get knowledge about traversing and triangulation by using compass, chain and theodolite.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE II Year-I Sem			
Course Code: L2181	MINE SURVEYING - I LAB	L	T	P	D
Credits: 1		0	0	2	0

Pre-Requisites: Nil

Course Objectives

This course will enable students to:

1. To familiarize with the various surveying instruments.
2. To familiarize with the various surveying methods.
3. To understand various Surveying techniques
4. To be proficient with various surveying techniques.
5. To be expert in all mine surveying techniques.

List of Experiments

1. Ranging a line, measuring the distance between two points, pacing.
2. Chain triangulation, booking, calculation of areas and plotting.
3. Traversing with compass.
4. Calculation of RL's – Simple Levelling Technique.
5. Fly levelling & Reduction of levels using Rise & Fall method and Height of instrument methods.
6. Profile levelling and plotting the section.
7. Contouring
8. Calculation of volume of a dump using reduced levels.
9. Measurement of Horizontal angle.
10. Measurement of vertical angle.
11. Theodolite traversing.

E-Resources

1. https://www.researchgate.net/publication/319996335_The_history_of_mine_surveying_and_mining_maps
2. http://www.survivorlibrary.com/library/a_manual_of_underground_surveying_1910.pdf

Course Outcomes

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

- CO1** Do the range between the two points and measure the distance between two points.
- CO2** Conduct the chain triangulation survey
- CO3** Determine the area by using different methods.
- CO4** Determine the elevation of a given point.
- CO5** Use the instruments used in the surveying.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE II Year-I Sem			
Course Code: L2182	MINING GEOLOGY LAB	L	T	P	D
Credits: 1		0	0	2	0

Pre-Requisites: Mining Geology

Course Objectives

This course will enable students to:

1. The geological concepts, processes, materials, and phenomena are wellunderstandable in the field rather than in the classroom.
2. The important minerals and rocks, models of geological structures.
3. The maps of different kinds in the laboratory.
4. To identify minerals, rocks, ores and geological structures.
5. To learn geological mapping, remote sensing techniques and geophysical methods

List of Experiments

1. Study of following physical properties: Odour, Streak, Cleavage, Fracture, Lustre, Specific Gravity, Magnetism & Electricity
2. Study of minerals exhibiting Mohs scale of hardness.
3. Megascopic study and identification of important rock forming mineral specimens.
4. Megascopic study and identification of important metallic ores.
5. Megascopic study and identification of important non-metallic ores.
6. Megascopic study and identification of important igneous rocks.
7. Megascopic study and identification of important Sedimentary rocks.
8. Megascopic study and identification of important metamorphic rocks.

Course Outcomes

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

- CO1** Identify the properties of rock forming and ore forming minerals.
- CO2** Determine the strike and dip of planar features by Clinometer Compass.
- CO3** Identify the folds, faults and unconformities.
- CO4** Understand the importance and uses of topographic and geological maps in themining profession
- CO5** Understand the unconfined compressive strength of important rocks.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE I Year-I Sem			
Course Code: L21M1	GENDER SENSITIZATION (Mandatory Course) COMMON TO: ALL	L	T	P	D
Credits: 0		2	0	0	0

Pre-Requisites:

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.

Textbooks

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

1. <https://www.medicalnewstoday.com/articles/232363>
2. <https://web.stanford.edu/~eckert/PDF/Chap1.pdf>
3. <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)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE II Year - II Sem			
Course Code: L22EA	MANAGERIAL ECONOMICS AND MANAGEMENT SCIENCE	L	T	P	D
Credits: 4		3	1	0	0

Pre-Requisites: Nil

Module 1:

Introduction to managerial economics, concepts of Managerial Economics: Demand Analysis: Law of Demand, Elasticity of demand & Demand forecasting.

Production & cost Analysis: Production functions, Law of returns, Economies of scale.

Cost concepts: Variable cost, fixed cost, Marginal cost, Semi-variable cost. Break – even analysis.

Module 2:

Market Structures: Different types of Markets.

Pricing: Methods of Pricing and Strategies

Financial Accounting & Financial Analysis: Overview of financial Accounts, Journal, Subsidiary books, Ledger, Trial Balance and preparation of Trading Account, Profit& Loss Account and Balance Sheet. Financial Analysis with the help of Ratios.

Module 3:

Management: Functions of Management, Taylor’s scientific management, Fayol’s principles of management.

Designing of organization structures: Different methods with merits and demerits and their suitability.

Human Recourse Management: Recruitment, Selection, Training and Development and Performance

Module 4:

Operation Management: Types of plant layout, Methods of production, Statistical quality control. X, R, C & P charts. Project Management: Program Evaluation & Review Technique (PERT), Critical Path Method (CPM), Identification of critical path.

Module 5:

Material Management: objectives, need for inventory control, EOQ, ABC Analysis, VED Analysis, Purchase procedure, Store Management.

Marketing: Functions, Marketing Mix, Marketing strategies based on product life cycle, channels of distribution.

Text Books

1. AR Aryasri: Managerial Economics & Financial Analysis – Tata McGraw Hills.
2. Managerial Economics & Financial Accounting – Prentice Hall of Inadia: Dr.M. Kasi Reddy, Dr. S. Saraswathi
3. Varshney & Maheswari: Managerial Economics, Sulthan Chand, 2009.
4. Ambrish Guptha, Financial Accounting for Management, Pearson Education, New Delhi, 2009.

Course Outcomes:

The student will be able to

1. Describes the basic structure of Caste system in India and the major four categories to which all castes could be
2. Learn to keep themselves safe and alive in the face of domestic violence.
3. Learn to maintain equality in gender. The student should have understood the responsibility of being good
4. describes the basic structure of Caste system in India and the major four categories to which all castes could be.
5. Learn about material management and marketing strategies.

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	1	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-	-	1
CO3	2	2	-	2	-	-	-	-	-	-	-	-	-	1
CO4	3	2	-	3	-	-	-	-	-	-	-	-	-	1
CO5	3	1	-	-	-	-	-	-	-	-	-	-	-	1
Average	2	2	3	3	-	-	-	-	-	-	-	-	-	1

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE II Year-II Sem			
Course Code: L220A	NUMERICAL TECHNIQUES (COMMON TO: CE, ME, & MIE)	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites:

Module –I Solutions of Non-linear Systems [8L]

Introduction, Mathematical preliminaries, Solution of algebraic and transcendental equations, bisection method, the method of false position, Fixed point iterative method, Newton - Raphson method, and their order of convergence.

Module 2: Interpolation [10L]

Introduction; Errors in polynomial interpolation, Finite differences, Forward differences, Backward differences, Central differences, Symbolic relations and separation of symbols, Differences of a polynomial, Newton's formulae for interpolation, Central difference interpolation formulae, Gauss's central difference formulae and Lagrange's interpolation formulae.

Module 3: Numerical Differentiation and Integration [10L]

Solution of initial value problems by Taylor's series, Picard's method of successive approximations, Euler's method, Modified Euler's method and Runge - Kutta methods, Trapezoidal rule, Simpson's 1/3 rule, and Simpson's 3/8 rule, Gaussian quadrature 2 & 3-point formulae.

Module 4: Partial Differential Equations of First Order [8L]

Introduction, Formation of partial equation by elimination of arbitrary constants, arbitrary functions, solutions of first order linear (Lagrange) equation and nonlinear (Standard type)

Module 5: Numerical Differentiation and Integration [10L]

Introduction, Classification of linear PDEs, Method of separation of variables to solve IBVP like 1-D heat, 1-D wave and BVP like 2-D Laplace's equations

Textbooks

1. Introduction- Classification of linear PDEs-Method of separation of variables to solve IBVP like 1-D heat, 1-D wave and BVP like 2-D Laplace's equations Grewal B.S, "Higher Engineering Mathematics", Khanna publications, 42nd edition 2012
2. Advanced Engineering Mathematics by Jain and S.R.K. Iyengar, Narosa Publications
3. Numerical Methods by T.K.V. Iyengar & B. Krishna Gandhi & Others, S. Chand
4. B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 2009

Reference Books

1. M. K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical methods for Scientific and Engineering Computation, New Age International Publications, 2008.
2. Engineering Mathematics by G. Shankar Rao, I.K. International Publications
3. KREYSZIG, E, "Advanced Engineering Mathematics" John Wiley & Sons Singapore, 10th edition, 2012
4. Veerarajan. T "Engineering Mathematics-I", Tata McGraw hill Publishing Co. New Delhi, 5th edition, 2006.
5. Engineering Mathematics by B. V. Ramana, Tata McGraw hill Publishing Company Ltd. New Delhi, 5th edition, 2011

E-Resources

1. https://link.springer.com/content/pdf/10.1007/978-3-642-61074-5_14.pdf
2. <https://link.springer.com/content/pdf/bbm%3A978-3-319-69407-8%2F1.pdf>
3. <https://stackoverflow.com/questions/19290455/interpolation-in-a-link>
4. <https://nptel.ac.in/courses/111103021>
5. <https://nptel.ac.in/courses/111101153>

Course Outcomes

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

- CO1.** Solve numerically algebraic and transcendental equations
CO2. Interpret an experimental data using interpolation
CO3. Solve numerically ordinary differential equations and integrations
CO4. Calculate the solution of algebraic and transcendental equations
CO5. Form first order pde and solution of pde

CO-PO/PSO Mapping

Course Outcomes	Program Outcomes(POs)/Program Specific Outcomes(PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO2	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO4	3	3	2	3	-	-	-	-	-	-	-	2	-	-
CO5	3	3	2	3	-	-	-	-	-	-	-	2	-	-
Average	3	3	2	3	-	-	-	-	-	-	-	2	-	-

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

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE II Year-II Sem			
Course Code: L228A	MINE SURVEYING II	L	T	P	D
Credits: 4		3	1	0	0

Pre-Requisites: Mine Surveying I

Course Objectives

This course will enable students to:

1. To introduce students about basics of surveying.
2. To familiarize the students with levelling & contouring
3. To introduce students about determination of area and volumes
4. To acquaint student with theodolite operation and application in surveying
5. To learn about various surveying instruments for surveying

Module 1

Unit I: Tacheometric Surveying: Use of the Theodolite for tacheometric Surveying – Principles, Stadia and tangential methods, measurements of heights and distances by tacheometry, Distance and Elevation formulae for Staff vertical and normal positions.

Unit II: Setting Out Curves: Types of curves, Elements of curves, design and setting out, simple and compound curves, surface, and underground curves.

Module 2

Unit I: Mine Survey: Verticality of shafts, measurement of depth of shafts, Importance of national grid and its advantages, survey of installations of mine structures.

Unit II: Correlation: Purpose and importance of correlation. Correlation methods- Co-planation method, Weiss triangle method, Weiss quadrilateral method, two shaft method, Correlation through drift

Module 3

Unit I: Total Station : Description, uses, different measurements by total station, types of Surveys by Total station, Mapping of sites by Total Station Surveys

Unit II: Photogrammetry: Principles of photogrammetry, Aerial Photographs, scale of vertical photographs, Terrestrial Photogrammetry, Mapping.

Module 4

Unit I: Geodetic Astronomy: Latitude, Longitude, Declination, Altitude, Azimuth, Hour circle, hour angle, other terminology; Time conversion from degrees to hours and hours to degrees.

Unit II: Theory of Errors – Classification of errors, terminology, different methods for adjustments of angles, levels – normal equation method, method of differences & method of correlates.

Module 5

Unit I: Global Positioning System: Definition, Principle, operations, and applications.

Geographical Information System: Definition, Principle, Components and Operation, Applications.

Unit II: Remote Sensing – basic Principles, Integration of RS and GIS, Applications.
Photogrammetric Surveying using drone.

Textbooks

1. Surveying – Theory and Practice by S.S.Bhavikatti, I.K.International publishing House.
2. Surveying Vol.2,3 by S.Ghatak, Lovely Prakashan Book house

Reference Books

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw Hill-2000
2. Arora K R "Surveying (Vol 1, 2 & 3), standard Book House, Delhi, 2004.
3. Chandra A M. "Plane Surveying" New age International Pvt. Ltd. Publisher, New Delhi, 2002.
4. Basics of Remote Sensing and GIS, Dr. S. Kumar.

E-Resources

1. <http://www.pobonline.com/articles/84226-underground-surveying>
2. <http://www.ism-minesurveying.org/mine-surveying.html>
3. <http://www.springer.com/gp/book/9781504123679>

Course Outcomes

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

- C01** Understand the fundamentals of surveying
- C02** Understand the fundamentals of levelling and contouring
- C03** Calculate areas and volumes of pits
- C04** Get knowledge about theodolite
- C05** Get knowledge about traversing and triangulation by using compass, chain and theodolite.

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE II Year-I Sem			
Course Code: L228B	MINE MECHANIZATION	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Nil

Course Objectives

This course will enable students to:

1. To understand the fundamentals of mine mechanization
2. To understand the fundamentals of various machinery used in mining
3. To understand the fundamentals of winding systems
4. To understand the fundamentals of conveyors
5. To understand the fundamentals of drills

Module 1

Unit I: Prime Mover for Mining Machinery: O.C. engine, hydraulic power, pneumatic power, elements of mechanical power transmission – gear, belt, chain, coupling, clutch, and brake.

Unit II: Rope haulage: Construction of the wire ropes, rope haulages – gravity, direct, balanced direct, main & tail, endless, reversible endless, Suitability of these haulages and their limitations. Dimension of ropes, drums and pulleys, care, and maintenance of ropes, changing of haulage ropes, rope splicing, and safety appliances in haulage road, signalling, Statutory requirements of haulages.

Module 2

Unit I: Mine Winders: Winding Drum-types and construction, Koepe and Drum winders and their applications, head gear, head gear pulley, shaft fitting – Keps, rope guides, shaft sinking and bells, capping and recapping, cage and suspension gear.

Unit II: Safety devices in winders-over speed and over wind preventers, slow breaking, depth indicator, Methods of counter balancing rope. Duty cycle. Mechanical and electrical braking. Winding from different levels in shaft.

Module 3

Unit I: Man riding system in underground mines. Face Machinery: SDL & LHD – their applications, capacity, operation, fitting, control, and maintenance.

Unit II: Cutter loaders – Shearers, Coal plough and Continuous Miners – their constructional features, applications, capacity, and maintenance.

Module 4

Unit I: Conveyors: Principal types and their operations, installation, shifting, maintenance and applicability, shuttle cars, stage loaders, bridge conveyors, capacity.

Unit II: Aerial Ropeways: Types, construction, Application and operation. Pumps: Types, Construction, operation, characteristics and application, Calculation of size, efficiencies, and capacities. Layout of drainage system.

Module 5

Unit I: Drills for Coal and Stone: Various types, their construction and maintenance, Jumbo drills.

Unit II: Opencast Machinery: Blast Hole Drill, Ripper, Shovel, Dragline, Dumper, Bucket Wheel Excavator, surface Miner – their basic construction, applications, and operation.

Textbooks

1. Deshmukh D.J., Vol. I, II & III Elements of Mining Technology
2. Alemgren G. Kumar – Mine Mechanization and Automation.
3. Introductory Mining Technology – HL Hartman

Reference Books

1. Mason – Coal Mining Series
2. Cherkasky B.M., Pumps Focus Compressors Walkar winding & Transport

E-Resources

1. <https://www.saimm.co.za/Journal/v102n03p131.pdf>
2. <https://www.nber.org/chapters/c6321.pdf>

Course Outcomes

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

- CO1** Understand the fundamentals of mine mechanization
- CO2** Understand the fundamentals of various machinery used in mining
- CO3** Understand the fundamentals of winding systems
- CO4** Understand the fundamentals of conveyors
- CO5** Understand the fundamentals of drills

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE II Year-I Sem			
Course Code: L228C	DRILLING & BLASTING	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Nil

Course Objectives

This course will enable students to:

1. To familiarize the students with exploratory and production drilling including the factors affecting drilling.
2. To familiarize the students about various factors & mechanics of drilling.
3. To introduce students about explosive and accessories and tools used in underground and opencast mining.
4. To introduce about underground blasting patterns
5. To learn various types of the explosives and blasting techniques used in underground and opencast mining are also explained besides blasting in civil constructions projects.

Module 1

Unit I: Exploratory Drilling: Drilling for Exploration and other purposes; Various types of drilling equipment- Their merits, demerits and limitations; core recovery-single and double tube core barrels, wire line drilling, Directional Drilling, Fishing tools, bore hole surveying, Bore Hole Logging, Novel and special drilling techniques, Horizontal and Directional Drilling.

Unit II: Production Drilling: Various methods of drilling-Percussion, Rotary and Rotary Percussive Drilling.

Module 2

Unit I: Drillability: Factors affecting drilling-Thrust, RPM, Flushing etc., Mechanics of drilling: Drillability and Drilling Index, Micro Bit Drilling, Physico-mechanical Properties effecting drillability, Design and Selection of Drills, Bit wear, Reconditioning of Drill Bits; Drill Hole Economics, Case Studies.

Module 3

Unit I: Explosives: Types of Explosives-Small Diameter, Large Diameter. Permitted, Bulk Slurry, SMS, EMS, ANFO, HANFO, LOX, Boosters, Blasting Agents, Mechanics of Blasting, Alternatives to Explosives.

Unit I: Accessories and Tools: Accessories, Detonators, Safety Fuses, Detonating Cords, Relays, NONEL, Exploders, sequential Blasting Machines and other Short Firing Tools, Testing Explosives, Storage, Transpiration and Handling of Explosives.

Module 4

Unit I: Under Ground Blasting: Drill Patterns for Underground Excavations, Shafts, Blast Pattern designs, Smooth Blasting, Induced Blasting, Charge Ratios, Rock Fragmentation, Dangers associated with underground blasting, Blasting Economics, Gallery Blasting, Statutory Requirements, Computer Design of Underground blast, Precautionary Measures, Misfires, Solid Blasting.

Module 5

Unit I: Open Pit Blasting: Methods of blasting in Open Cast Mines, Blast Design, Primary and Secondary Blasting, Fragmentation Studies, Accidents due to Blast in Open Cast and Preventive Measures. Environmental Impact due to Blasting, Ground Vibrations, Fly Rocks, Dust, Fumes, Water Pollution, Dimensional Stone Blasting, Control Blasting, Statutory Requirements, Computer Design of Open Cast Blast.

Unit II: Blasting for Civil Construction and Trenches: Blasting for Road Constructions, Trenches Cutting in soft and Hard Rocks, Demolition of Building Etc., Under Water Blasting.

Textbooks

1. Roy Pijush Pal, Blasting in Ground Excavations and Mines, Oxford and IBH Publications, 1 Edition, 1993
2. C.P.Chugh, Drilling Technology handbook, Oxford and IBH, 1 Edition, 1977.

Reference Books

1. Roy Pijush Pal, Rock Blasting effect and operation, A.A.Balkema, 1 Edition, 2005.
2. D.J.Deshmukh, Elements of Mining Technology, Vol 1, Central Techno, 7th Edition, 2001
3. B.Hamphill Gary, Blasting Operations, Mc Graw Hill, 1 Edition, 1981.

E-Resources

1. <http://technology.infomine.com/reviews/blasting/welcome.asp?view=full>
2. <https://miningandblasting.wordpress.com/list-of-technical-papers/>

Course Outcomes

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

- CO1** Understand the fundamentals of exploratory and production drilling
- CO2** Get knowledge about Drilling mechanism and factors effecting drilling.
- CO3** Get the knowledge about different blasting patterns used in underground mining
- CO4** Understand about blasting in open pit mining.
- CO5** Get knowledge about Blasting for Civil Construction and Trenches

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE II Year-I Sem			
Course Code: L228D	UNDERGROUND METAL MINING TECHNOLOGY	L	T	P	D
Credits: 3		3	0	0	0

Pre-Requisites: Nil

Module 1

Unit I: Introduction: Formation of Ore Deposits, difference between underground coal mining and metal mining, Metal Mining terminology, Mineral resource, and mineral reserve

Unit II: Development: Stages of mineral development, Principles for mine development, Level interval, Different types of openings-primary, secondary & tertiary.

Module 2

Unit I: Different types of raising methods- Open raising, compartment raising, raising by jora lift, raising by longhole drilling

Unit II: Alimak raise climbing, raise borers, and drop raising and their merits & demerits.

Module 3

Unit I: Stope development – development of stopes, ore pass, ore chutes, finger raises, haulage requirements etc.

Unit II: Stopping methods: Classification of stopping methods, factors influencing the choice of stopping methods, Different stopping methods for different applications, Room & Pillar stopping, Sublevel Open Stopping, Shrinkage method of Stopping, Cut & Fill method of Stopping, Sublevel Caving, Block Caving – Applications, Stopping procedure, merits, and demerits

Module 4

Unit I: Special methods of working of thin deposits – Top Slicing, VCR method, Longwall method, Square set stopping and stull method.

Unit II: Auxiliary operations in stopping operations - ground-breaking, mucking, ventilation, supporting, haulage, and dumping. Dilution of ore in stopping operations, classification of dilution and the effects of dilution

Module 5

Unit I: Economic analysis for the assessment of viability of a mineral deposit- feasibility report, Economic considerations of stopping operations .

Unit II: In-situ leaching: Principles of in-situ leaching, procedure of recovery of minerals by ISL, scope and limitation of in-situ leaching.

Textbooks

1. Introduction to Mining Technology, Prof. G.K. Pradhan.
2. Introductory Mining Engineering – H.L. Hartman.

Reference Books

1. Underground Mining Methods handbook
2. Underground Mining Methods and Technology – Elsevier Science publication.
3. Karmakar H. – Mine working Vol. I & II, Lovely Prakashan, Dhanbad

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B.Tech. MIE II Year-I Sem			
Course Code: L2281	MINE SURVEYING – II LAB	L	T	P	D
Credits: 1		0	0	2	0

Pre-Requisites: Mine Surveying – II

List of Experiments

1. Finding Horizontal & Vertical distance by Tachometry
2. Curve ranging by offsets from long chord
3. Curve ranging by Rankine method
4. Curve ranging by Tachometric method
5. Study of mine plans using signs and conventions in CMR 1957/MMR1961, statutory provisions of mine plans
6. Finding the height of an in accessible object – Trigonometric levelling
7. Correlation by co-planation method using Theodolite
8. Correlation by single shaft Weisbach method using theodolite
9. Correlation by single shaft Weiss quadrilateral method using theodolite
10. Measurement of REM, RDM by total station
11. Traversing by Total station.
12. Introduction to Modern Surveying tools.

Textbooks

1. Surveying – Theory and Practice by S S. Bhavikatti, I K International publishing House
2. Ghatak "Mine Surveying and Levelling Vol.2"
3. Punimia "Surveying" Vol. II and III
4. Basak "Surveying and Levelling"

AY: 2022-23 Onwards	J. B. Institute of Engineering and Technology (UGC Autonomous)	B. Tech CE II Year-II Sem			
Course Code: L22M2	ENVIRONMENTAL SCIENCE (Common to ALL)	L	T	P	D
Credits: 0		2	0	0	0

Pre-Requisites: Nil.

Module 1:

Unit-1: 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-1: 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

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	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