# ACADEMIC REGULATIONS

# COURSE STRUCTURE AND

# DETAILED SYLLABUS

## CIVIL ENGINEERING

## B. TECH FOUR YEAR UG COURSE

(Applicable for the batches admitted from 2022-2023)

## REGULATION: R22
## (I - IV 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.

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# DEPARTMENT-VISION AND MISSION

### Vision of CIVIL Engineering Program:

To be a Centre for Excellence in Civil Engineering education with a thrust on fundamentals, spirit of innovation and to meet the changing needs of local and global industry.

### Mission of CIVIL Engineering Program:

1. To achieve academic excellence by imparting sound technical knowledge based on strong fundamentals of science and engineering that leads to higher education and research.
2. To imbibe the spirit of innovation by being responsive to the needs of industry and promoting industry institute interaction, ensuring social relevance and professional ethics.
3. To equip students with leadership qualities to become entrepreneurs and take up technologies that cater to the changing demands of society.

## Program Educational Objectives (PEOs)

### PEO1
Demonstrate sound technical competency and professional ethics to become professional engineer leading to a successful career.

### PEO2
Pursue lifelong learning in generating innovative engineering solutions based on research outcomes and developing problem-solving skills.

### PEO3
Demonstrate leadership qualities in addressing changing needs of the society.

# Program Outcomes and Program Specific Outcomes of CIVIL Engineering 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 modeling 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.

**PSO1**
Understand, analyze and design sub-structures and superstructures for residential and public buildings, industrial structures, irrigation structures, powerhouses, highways, railways, airways, docks and harbours.
**PSO2**
Conduct surveys for infrastructural projects, prepare survey reports and project cost estimates, and apply the data for various infrastructural projects.

# 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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# J.B. INSTITUTE OF ENGINEERING AND TECHNOLOGY

**(UGC Autonomous)**
**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)
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.

**3.3** However, student is permitted to appear in the supplementary examinations for *two* **more** academic years after the Maximum Duration of course work as mentioned in **3.2** to complete backlog subjects for fulfilling the academic requirements for the completion of the programme, failing which he/she shall forfeit his / her seat in B.Tech course.

## 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 (ElC) | 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 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 secondyear second semester | Regular course of study of second year firstsemester. |
| 2 | Second year second semester to thirdyear first semester | (**i**) Regular course of study of second yearsecond 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 yearsecond semester | Regular course of study of third year firstsemester. |
| 4 | Third year second semester to fourth year first semester | (i) Regular course of study of third yearsecond 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 fourthyear second semester | Regular course of study of fourth year firstsemester |

## 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*Total-marks - 0.35*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 ≥ 5 ('C' grade or above).

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

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

(i.e., up to and inclusive of S semesters, S ≥ 2),

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

**Illustration of calculation of SGPA:**

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

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

**Illustration of calculation of CGPA up to 3rd semester:**

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

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

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

**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 |

| | | |
|---|---|---|
| | 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 | other subjects the student(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a Police case is registered against them. |
| 6. | Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall. | Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that Semester/year. The student is also debarred for two consecutive semesters from class work and all End examinations. The |

| | | continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. |
|---|---|---|
| 7. | Possesses any lethal weapon or firearm in the examination hall. | Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat. |
| 8. | If student of the college, who is not a 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.*

# 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 ofspecializations.

### 2. Academic Regulations for B. Tech. Honours degree

1) The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B. Tech. 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. degreecourse & vice versa.

5) These 20 credits are to be earned from the additional courses offered by the host department in the college or from a closely related department in the college as well as from the MOOCS platform.

**6) Guidelines for courses selected under MOOCs platform :**

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

b) Department wise MOOCs finalized are to be consolidated and needs to be approved by BOS before commencement of the semester.

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

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

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

7) The **choice to opt/take the Honours 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.

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## 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 ofengineering.

- 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-disciplinaryareas in addition to their own branch of study.

- To offer the knowledge in the areas which are identified as emerging technologies/thrustareas of Engineering.

### 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.

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| B. Tech – Civil Engineering |
|---|

### 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 | Maths |
| 2 | L110D | Engineering Chemistry | 3 | 0 | 0 | 0 | 3 | BS | Y | CHEMTIRY |
| 3 | L112B | Fundamentals of Electrical circuits and Electronic Devices | 3 | 0 | 0 | 0 | 3 | ES | Y | EEE |
| 4 | L113A | Engineering Mechanics | 3 | 0 | 0 | 0 | 3 | ES | Y | CE |
| 5 | L1131 | Engineering Drawing | 2 | 0 | 2 | 0 | 3 | ES | Y | MECH |
| 6 | L1103 | Chemistry Lab | 0 | 0 | 2 | 0 | 1 | BS | Y | CHEMTIRY |
| 7 | L1133 | Workshop/ Manufacturing Practices | 3 | 0 | 0 | 0 | 3 | ES | Y | MECH |
| 8 | L11T1 | Functional English | 2 | 0 | 0 | 0 | 0 | AC | Y | English |
| | | **Total** | **19** | **1** | **4** | **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 | Maths |
| 2 | L120E | Engineering Physics | 3 | 0 | 0 | 0 | 3 | BS | Y | Physics |
| 3 | L120B | English | 3 | 0 | 0 | 0 | 3 | HS | Y | English |
| 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 | L12T2 | Human Values and Professional Ethics | 2 | 0 | 0 | 0 | 0 | AC | Y | MBA |
| | | **Total** | **14** | **2** | **8** | **0** | **18** | | | |

| | B. Tech – Civil Engineering | |
|---|---|---|

## 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 | - |
| 2 | L211A | Surveying | 3 | 0 | 0 | 0 | 3 | PC | N | CE |
| 3 | L211B | Building Materials, Construction and Services | 2 | 0 | 0 | 0 | 2 | PC | N | CE |
| 4 | L211C | Strength of Materials | 3 | 0 | 0 | 0 | 3 | PC | N | CE |
| 5 | L211D | Fluid Mechanics | 3 | 0 | 0 | 0 | 3 | PC | N | CE |
| 6 | L211E | Engineering Geology | 2 | 0 | 0 | 0 | 2 | PC | N | CE |
| 7 | L2111 | Surveying Lab | 0 | 0 | 2 | 0 | 1 | PC | N | CE |
| 8 | L2112 | Strength of Materials Lab | 0 | 0 | 2 | 0 | 1 | PC | N | CE |
| 9 | L2113 | Internship | 0 | 0 | 2 | 0 | 1 | PW | N | CE |
| 10 | L21M1 | Gender Sensitization | 2 | 0 | 0 | 0 | 0 | MC | Y | - |
| | | **Total** | 18 | 1 | 6 | 0 | 20 | | | |

## II Year II Semester

| S. No | Code | Course Title | L | T | P | D | Credits | Category | common Subject (Y/N) | Approving BOS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | L22EA | Business Economics and Financial Analysis | 3 | 1 | 0 | 0 | 4 | HS | Y | - |
| 2 | L220A | Numerical Techniques | 3 | 0 | 0 | 0 | 3 | BS | Y | - |
| 3 | L221A | Hydraulics and Hydraulic Machinery | 3 | 0 | 0 | 0 | 3 | PC | N | CE |
| 4 | L221B | Strength of Materials - II | 3 | 0 | 0 | 0 | 3 | PC | N | CE |
| 5 | L221C | Concrete Technology | 3 | 0 | 0 | 0 | 3 | PC | N | CE |
| 6 | L221D | Structural Analysis - I | 3 | 0 | 0 | 0 | 3 | PC | N | CE |
| 7 | L2211 | Concrete Technology Lab | 0 | 0 | 2 | 0 | 1 | PC | N | CE |
| 8 | L2212 | Fluid Mechanics and Hydraulic Machinery Lab | 0 | 0 | 2 | 0 | 1 | PC | N | CE |
| 9 | L2213 | Computer-Aided Civil Engineering Drawing | 0 | 0 | 2 | 0 | 1 | ES | N | CE |
| 10 | L22M2 | Environmental Science | 2 | 0 | 0 | 0 | 0 | MC | Y | CE |
| | | **Total** | 20 | 1 | 6 | 0 | 22 | | | |

| S. No | Code | Course Title | L | T | P | D | Credits | Category | common Subject (Y/N) | Approving BOS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **III Year I Semester** | | | | | | | | |
| 1 | L311A | **Geotechnical Engineering** | 3 | 0 | 0 | 0 | 3 | PC | N | CE |
| 2 | L311B | **Structural Engineering –I (RCC)** | 3 | 1 | 0 | 0 | 4 | PC | N | CE |
| 3 | L311C | **Environmental Engineering** | 3 | 0 | 0 | 0 | 3 | PC | N | CE |
| 4 | BTCEE1 | **PE-1** | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 5 | BTCEO1 | **OE-1** | 3 | 0 | 0 | 0 | 3 | OE | N | CE |
| 6 | L3111 | **Geotechnical Engineering Lab** | 0 | 0 | 3 | 0 | 1.5 | PC | N | CE |
| 7 | L3112 | **Environmental Engineering Lab** | 0 | 0 | 3 | 0 | 1.5 | PC | N | CE |
| 8 | L3113 | **Internship** | 0 | 0 | 2 | 0 | 1 | PW | N | CE |
| 9 | L31M1 | **Artificial Intelligence** | 2 | 0 | 0 | 0 | 0 | MC | Y | - |
| 10 | L31T1 | **Employability Skills** | 2 | 0 | 0 | 0 | 0 | AC | Y | - |
| | | **Total** | 19 | 1 | 8 | 0 | 20 | | | |

| S. No | Code | Course Title | L | T | P | D | Credits | Category | common Subject (Y/N) | Approving BOS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | **III Year II Semester** | | | | | | | | |
| 1 | L321A | **Transportation Engineering** | 3 | 1 | 0 | 0 | 4 | PC | N | CE |
| 2 | L321B | **Foundation Engineering** | 3 | 0 | 0 | 0 | 3 | PC | N | CE |
| 3 | BTCEE2 | **PE-2** | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 4 | BTCEE3 | **PE-3** | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 5 | BTCEO2 | **OE-2** | 3 | 0 | 0 | 0 | 3 | OE | Y | CE |
| 6 | BTCEO3 | **OE-3** | 3 | 0 | 0 | 0 | 3 | OE | Y | CE |
| 7 | L3211 | **Transportation Engineering Lab** | 0 | 0 | 2 | 0 | 1 | PC | N | CE |
| 8 | L3201 | **Life Skills and Professional Skills** | 0 | 0 | 4 | 0 | 2 | HS | Y | - |
| 9 | L32M2 | **Cyber Security** | 2 | 0 | 0 | 0 | 0 | MC | Y | - |
| 10 | L32T2 | **Foundations of Entrepreneurship** | 2 | 0 | 0 | 0 | 0 | AC | Y | - |
| | | **Total** | 22 | 1 | 6 | 0 | 22 | | | |

**IV Year I Semester**

| S. No | Code | Course Title | L | T | P | D | Credits | Category | common Subject (Y/N) | Approving BOS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | L411A | Energy Science & Engineering | 3 | 0 | 0 | 0 | 3 | ES | Y | CE |
| 2 | L411B | Structural Engineering – II (Steel) | 3 | 0 | 0 | 0 | 3 | PC | N | CE |
| 3 | L411C | Hydrology and Water Resources Engineering | 3 | 0 | 0 | 0 | 3 | PC | N | CE |
| 4 | BTCEE4 | PE-4 | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 5 | BTCEE5 | Mandatory MOOC (PE-5) | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 6 | BTCEO4 | OE-4 | 3 | 0 | 0 | 0 | 3 | OE | N | CE |
| 8 | L4111 | Computer-Aided Design and Drafting Lab | 0 | 0 | 2 | 0 | 1 | PC | N | CE |
| 9 | L4112 | Mini Project | 0 | 0 | 4 | 0 | 2 | PW | N | CE |
| 10 | L4113 | Project Stage-I | 0 | 0 | 4 | 0 | 2 | PW | N | CE |
| 11 | L411M1 | Building Bylaws and Quality Standards | 2 | 0 | 0 | 0 | 0 | MC | N | CE |
| | | **Total** | 20 | 0 | 10 | 0 | 23 | | | |

**IV Year II Semester**

| S. No | Code | Course Title | L | T | P | D | Credits | Category | common Subject (Y/N) | Approving BOS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BTCEE5 | PE-6 | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 2 | BTCEO5 | OE-5 | 3 | 0 | 0 | 0 | 3 | OE | N | CE |
| 3 | L4211 | Seminar | 0 | 0 | 2 | 0 | 1 | PW | N | CE |
| 4 | L4212 | Project Stage 2 | 0 | 0 | 16 | 0 | 8 | PW | N | CE |
| | | **Total** | 6 | 0 | 18 | 0 | 15 | | | |

### Professional Elective-I

| S. No | Code | Course Title | L | T | P | D | Credits | Category | common Subject (Y/N) | Approving BOS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | L311E | Structural Analysis - II | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 2 | L311F | Ground Water Management | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 3 | L311G | Sustainable Materials & Green Buildings | 3 | 0 | 0 | 0 | 3 | PE | N | CE |

### Professional Elective-II

| S. No | Code | Course Title | L | T | P | D | Credits | Category | common Subject (Y/N) | Approving BOS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | L321E | Industrial Waste Water Treatment | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 2 | L321F | Remote Sensing and GIS | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 3 | L321G | Structural Health Monitoring | 3 | 0 | 0 | 0 | 3 | PE | N | CE |

### Professional Elective-III

| S. No | Code | Course Title | L | T | P | D | Credits | Category | common Subject (Y/N) | Approving BOS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | L321H | Estimation, Costing and Valuation | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 2 | L321I | FEM for Civil Engineering | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 3 | L321J | Construction Technology and Project Management | 3 | 0 | 0 | 0 | 3 | PE | N | CE |

### Professional Elective-IV

| S. No | Code | Course Title | L | T | P | D | Credits | Category | common Subject (Y/N) | Approving BOS |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | L411E | Pre-Stressed Concrete Structures | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 2 | L411F | Pavement Design | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 3 | L411G | Ground Improvement Techniques | 3 | 0 | 0 | 0 | 3 | PE | N | CE |

| **Professional Elective-V(Mandatory MOOC)** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No | Code | Course Title | L | T | P | D | Credits | Category | common Subject (Y/N) | Approving BOS |
| 1 | L411H | Modern Construction Materials | 3 | 0 | 0 | 0 | 2 | PE | N | CE |
| 2 | L411I | Pollutants and Water Supply | 3 | 0 | 0 | 0 | 2 | PE | N | CE |
| 3 | L411J | Safety in Construction | 3 | 0 | 0 | 0 | 2 | PE | N | CE |

| **Professional Elective-VI** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| S. No | Code | Course Title | L | T | P | D | Credits | Category | common Subject (Y/N) | Approving BOS |
| 1 | L421A | Urban Waste Management | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 2 | L421B | Rehabilitation and Retrofitting of structures | 3 | 0 | 0 | 0 | 3 | PE | N | CE |
| 3 | L421C | Advanced Structural Engineering | 3 | 0 | 0 | 0 | 3 | PE | N | CE |

| **Open Elective-I** | | | | | |
|---|---|---|---|---|---|
| **S. No** | **Code** | **Course Title** | **L** | **Credits** | **Approving BOS** |
| 1 | L31OA | Elements of CIVIL Engineering | 3 | 3 | CE |
| 2 | L31OB | Introduction to Computer Networks | 3 | 3 | CSE |
| 3 | L31OC | Introduction to Machine Learning | 3 | 3 | AI&ML |
| 4 | L31OD | Fundamentals Of Data Science | 3 | 3 | AI&DS |
| 5 | L31OE | Principles of Communications | 3 | 3 | ECE |
| 6 | L31OF | Fundamentals of Digital Logic Design | 3 | 3 | ECM |
| 7 | L31OG | Energy Engineering | 3 | 3 | EEE |
| 8 | L31OH | Open Source Software's | 3 | 3 | IT |
| 9 | L31OI | Automotive Technology | 3 | 3 | MECH |
| 10 | L31OJ | Introduction to Mining Technology | 3 | 3 | MINING |
| 11 | L31OK | Entrepreneurship for Micro, Small and Medium Enterprises | 3 | 3 | MBA |
| 12 | L31OL | Numerical solutions of ODE | 3 | 3 | Maths |
| 13 | L31OM | Nano materials | 3 | 3 | Physics |
| 14 | L31ON | Chemistry of Engineering materials | 3 | 3 | Chemistry |
| 15 | L31OO | Technical writing skills | 3 | 3 | English |
| 16 | L31OP | Indian Constitution | 3 | 3 | English |

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

| Open Elective-III | | | | | |
|---|---|---|---|---|---|
| **S. No** | **Code** | **Course Title** | **L** | **Credits** | **Approving BOS** |
| 1 | L32OQ | Road Safety Engineering | **3** | **3** | CE |
| 2 | L32OR | Introduction to Java Programming | **3** | **3** | CSE |
| 3 | L32OS | Introduction to Neural Networks | **3** | **3** | AI&ML |
| 4 | L32OT | Health Care Data Analytics | **3** | **3** | AI&DS |
| 5 | L32OU | MATLAB Programming Language | **3** | **3** | ECE |
| 6 | L32OV | Introduction to Sensors and it's Applications | **3** | **3** | ECM |
| 7 | L32OX | Non-Conventional Energy Sources | **3** | **3** | EEE |
| 8 | L32OY | Soft Computing | **3** | **3** | IT |
| 9 | L32OZ | Basics of Robotics | **3** | **3** | MECH |
| 10 | L32O1 | Basic Mining Geology | **3** | **3** | MINING |
| 11 | L32O2 | Digital Marketing | **3** | **3** | MBA |
| 12 | L32O3 | Number Theory and Cryptography | **3** | **3** | Maths |
| 13 | L32O4 | NDT and Vaccum Technology | **3** | **3** | Physics |
| 14 | L32O5 | Chemistry for Engineers | **3** | **3** | Chemistry |
| 15 | L32O6 | Technical communication skills | **3** | **3** | English |

| **Open Elective-IV** | | | | | |
|---|---|---|---|---|---|
| **S. No** | **Code** | **Course Title** | **L** | **Credits** | **Approving BOS** |
| 1 | L41OA | Environmental Impact Assessment | 3 | 3 | CE |
| 2 | L41OB | Introduction to Python Programming | 3 | 3 | CSE |
| 3 | L41OC | Introduction to Deep Learning | 3 | 3 | AI&ML |
| 4 | L41OD | Fundamentals of Big Data | 3 | 3 | AI&DS |
| 5 | L41OE | Consumer Electronics | 3 | 3 | ECE |
| 6 | L41OF | Introduction to Embedded Systems | 3 | 3 | ECM |
| 7 | L41OG | Special Electrical Machines | 3 | 3 | EEE |
| 8 | L41OH | Object Oriented Analysis and Design | 3 | 3 | IT |
| 9 | L41OI | Basics of MINE Environment | 3 | 3 | MINING |
| 10 | L41OJ | Rural Marketing | 3 | 3 | MBA |

**B. Tech – ALL BRANCHES**

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

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | **B. Tech** **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 it Applications**

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**

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

**Module 3: Sequences and Fourier series**

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**

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's**

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.

**Text Books**

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

**Reference Books**

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

**E-Resources**

https://nptel.ac.in/courses/111106100
https://www.math.ust.hk/~machas/differential-equations.pdf
https://en.wikipedia.org/wiki/Fourier_series
https://www.khanacademy.org/math/ap-calculus-bc/bc-integration-new/bc-6-13/a/improper-integrals-review
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** **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

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($N_2$, $O_2$ and $F_2$), 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

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 ozonization- 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

**Electrochemistry**
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-$MnO_2$ cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).

**Corrosion**
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**

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

**Polymers**
Definition – Types of polymerization – 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**
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.

**Text Books**

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. Text Book 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 also 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 EEE** **I Year-I Sem** | | | |
|---|---|---|---|---|---|---|
| Course Code: **L112B** | **Fundamentals of Electrical Circuits and Electronic Devices** | | L | T | P | D |
| Credits: **3** | **(Common to CE, ME & MIE)** | | **3** | **0** | **0** | **0** |

**Pre-Requisites:**

## Module 1: DC Circuits
**Unit-I:**
Electrical quantities – Electrical circuit elements - resistors - inductors - capacitors - voltage and current sources - Source transformations  - Ohm's Law - Kirchhoff's Laws - simple problems.
**Unit-II:**
Network reduction techniques - series and parallel circuits - analysis of DC circuits - mesh, nodal - simple problems.

## Module 2: AC Circuits
**Unit-I:**
Sinusoidal functions - phasor representation - RMS and Average values - form and peak factors.
**Unit-II:**
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
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)
**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 " $\alpha$" and " $\beta$ " of a transistor from the V-I characteristics , relation between " $\alpha$" and " $\beta$ " of a transistor.

## Module 5: FIELD EFFECT TRANSISTER
**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.

## Text Books

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., 10<sup>th</sup> 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.    Analyze DC electrical circuits using network laws.

CO 2.    Analyze 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) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 | 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**

**Pre-Requisites:** Engineering Physics.

## Module 1: Resultant Force system and Equilibrium of Force System

**Unit-I:**
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:**
Free body diagram, equation of equilibrium of coplanar and spatial force systems.

## Module 2: Friction, Analysis of Trusses and Virtual Work

**Unit-I:**
Laws of friction, application of friction to a single body & connecting systems, wedge friction

**Unit-II:**
Analysis of perfect trusses using method of joints and method of sections.

**Unit-III:**
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

**Unit-I:**
Centroid of simple planes (from first principles), Centroid of Composite sections, Centre of gravity and its implications, Pappu"s theorems.

**Unit-II:**
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

**Unit-I:**

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

**Unit-II:**
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

**Unit-I:**
Work Energy Principle and its application to Translation, Fixed axis rotation and plane motion.

**Unit-II:**
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) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| **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:** I Year - I Sem | | | |
|---|---|---|---|---|---|---|
| Course Code: **L1131** | **ENGINEERING DRAWING** | | L | T | P | D |
| Credits: 3 | (COMMON TO: CE, EEE, ME, ECE, MIE, AIML) | | **1** | **0** | **4** | **0** |

**Pre-Requisites:** Engineering Mathematics.

## Module 1: Principles of Engineering Drawing, Conic Sections, Curves, Scales

**Unit-I:**
Introduction to Engineering Drawings, Significance, Introduction to AutoCAD.

**Unit-II:**
Ellipse – Eccentric Method, Arcs Method, Concentric, Circle Method, Rectangular Method; Parabola – Eccentric Method, Rectangular Method.

**Unit-III:**
Cycloid – Epicycloid, Hypocycloid, Involute of Circles.

**Unit-IV:**
Construction of Plane, Diagonal Scales.

## Module 2: Principles of Orthographic Projections, Projections of Points, Line, Planes

**Unit-I:**
Introduction to Orthographic Projections, Conventions.

**Unit-II:**
Projections of Points in four Quadrants, Projection of Lines in first quadrant, Inclined to both Principle Planes.

**Unit-III:**
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

**Unit-I:**
Projections of Right Regular Solids – Prisms and Pyramids of Square, Pentagon, Hexagon;

**Unit-II:**
Projections of Generated Solids – Cone, Cylinder.

## Module 4: Sections of Solids, Development of Surfaces of Solids

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

**Unit-II:**
Surfaces of Right Regular solids – Prism, cylinder pyramid and cone

## Module 5: Isometric Projections, Orthographic Views

**Unit-I:**
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:**
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 Kannaiah, "Text book on Engineering Drawing", Scitech Publish, 2008
2. Agrawal B. & Agrawal C. M., "Engineering Graphics", TMH Publn, 2012.

## E-Resources

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

## Course Outcomes

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

**CO1**. 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 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 $Fe^{2+}$ in Mohr's salt using permanganomerty.

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 $Fe^{2+}$ by Potentiometry using $KMnO_4$.

### 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.

## Text Books

1.Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg, (R. Chand & Co., Delhi)

2.An introduction to practical chemistry, K.K. Sharma & D.S. Sharma, (Vikas publishing, N. Delhi)

3."Text book of practical organic chemistry", Vogel's ,5th edition.

4."Text book on Experiments and calculations in engineering chemistry", S.S. Dara

## Course Outcomes

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

1.Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.

2.Calculate the concentration and amount of various substances using instrumental techniques.

3.Synthesize the engineering materials like nanomaterials, polymers and drug molecules.

4.Determine the physic-chemical properties like partition co-efficient, surface tension and viscosity.

5.Determine the partition coefficient of organic compound in two immiscible liquids.

**Course Outcomes**

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | B. Tech: 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**

**Pre-Requisites:**

## Module 1: FUNCTIONAL ENGLISH

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

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

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

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

## Module 5: COMMUNICATION SKILLS

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

## Text Books

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**

- https://www.britishcouncil.in/programmes/english-partnerships/state/skills-projects/AP-English-Skills.
- 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 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**

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**

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**

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**

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**

Line, surface and volume integrals.

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

**Text Books**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 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,11thReprint, 2010.

**E-Resources**

https://nptel.ac.in/courses/111/108/111108098/
https://en.wikipedia.org/wiki/Eigenvalues_and_eigenvectors
https://nptel.ac.in/courses/111/107/111107108/
https://www.cheric.org/files/education/cyberlecture/e200303/e200303-301.pdf
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 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| **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 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**

**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, Farunhofer 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 :**

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:**

**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 Cantered Cubic, Face Cantered 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**

**Laser**s: 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.

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

**Module–5: Dielectric and Magnetic Properties**

**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, Ferro-electricity 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-
3. freedownload?s=1b6cb6b1de4e7152298bd9d60156cd11 3. 4.http://aip.scitation.org/journal/jap
5. http://www.springer.com/physics/journal/340 5. 5.
 6. http://nptel.ac.in/courses/115101005/1 6. http://nptel.ac.in/courses/115106061/13.

**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. Analyze the bonding scheme and its physical properties of a given material
4. Analyze 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** **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:**

**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:**

**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**

**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:**

**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: |
| --- |

**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.

| Text Books |
| --- |

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/ls-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=b3VnYo7lFJqf4-EP9fqTIA&ved=0ahUKEwjO2Ki98rD3AhWazzgGHXX9BAQQ4dUDCA4&uact=5&oq=Continuous+Transformation-+Azim+Premji+&gs_lcp=Cgdnd3Mtd2l6EAMyBQghEKABMgUIIRCgATIFCCEQoAFKBAhBGABKBAhGGABQAFgAYLs1aAFwAXgAgAHyAYgB8gGSAQMyLTGYAQCgAQKgAQHAAQE&sclient=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) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PS O2 |
| **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 I Year-II Sem | | | |
|---|---|---|---|---|---|
| Course Code: **L125A** | **PROGRAMMING FOR PROBLEM SOLVING** (Common to ECE, CSE, IT & ECM) | L | T | P | D |
| Credits: 4 | | **3** | **1** | **0** | **0** |

**Pre-Requisites:**

1. Mathematical Knowledge.
2. Analytical Skills.

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

**Module 1:**

**INTRODUCTION TO PROGRAMMING:**

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

**Introduction to C Programming Language:** variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments

**Bitwise operations:** Bitwise AND, OR, XOR and NOT operators Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, 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:**

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

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

**Structures:** Defining structures, initializing structures, unions, Array of structures.

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

**Module 3:**

## POINTERS AND FILE HANDLING IN C:

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

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

**Module 4:**

## FUNCTION AND DYNAMIC MEMORY ALLOCATION:

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

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

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

**Module 5:**

## INTRODUCTION TO ALGORITHMS:

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

**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, (3<sup>rd</sup>Edition).

**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 (16<sup>th</sup>Impression)

3. Stephen G. Kochan, Programming in C, Fourth Edition, PearsonEducation.
4. Herbert Schildt, C: The Complete Reference, McGraw Hill, 4[th]Edition
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%20EngineeringSandipFundaments_of_C.pdf
6. http://cs.indstate.edu/~cbasavaraj/cs559/the_c_programming_language_2.pdf

**Course outcomes:**

**The student 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.

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CO-PO/PSO Mapping Chart** **(3/2/1 indicates strength of correlation)** **3 – Strong; 2 – Medium; 1 - Weak** | | | | | | | | | | | | | | |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| **CO1** | 3 | 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 |
| **Average** | **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** **I Year-I & II Sem** | | | |
|---|---|---|---|---|---|---|
| Course Code: **L1202** | **PHYSICS LAB** (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 Wave length 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 turning 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.**

**Text Books**

1.Dr. Narendra, L. Mathakari,"Experiments in Applied Physics" ( Physics Lab Manual 4$^{th}$edition) ,
2. " Engineering Physics Lab Resources"  By  Department of Physics JBIET.

**Course Outcomes**

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

**Pre-Requisites:**

**English Language and Communication Sills Lab (ELCS) will have two parts:**
   a) **Computer Assisted Language Learning (CALL) Lab:**
   b) **Interactive Communication Skills (ICS) Lab:**

**Module 1:**

**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:**

**CALL Lab**:

The Phoneme: The Syllable

**ICS Lab**:

Features of Good Conversation – Non-verbal Communication- Telephone Etiquette.

**Module 3:**

**CALL Lab**:

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

**ICS Lab**:

Presentations Skills-Formal Presentations.

**Module 4:**

**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:**

**CALL Lab**:
Listening for Specific Details-Listening Comprehension Tests.
**ICS Lab**:
Interview Skills-Mock Interviews.

## Text Books

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) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PS O2 |
| 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** **I Year-II Sem** | | | |
|---|---|---|---|---|---|
| Course Code: **L1251** | **PROGRAMMING FOR PROBLEM SOLVING LAB** (Common to CSE, IT, ECE & ECM) | L | T | P | D |
| Credits: 2 | | **0** | **0** | **4** | **0** |

## Pre-Requisites:

1. Mathematical Knowledge.
2. Analytical Skills.

## Course objectives:

## The student will:

1. Work with an IDE to create, edit, compile, run and debug programs

2. Analyse the various steps in program development.

3. Develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.

4. Develop modular, reusable, and readable C Programs using the concepts like functions, arrays etc.

5. Write programs using the Dynamic Memory Allocation concept, files

## Lab Experiments:

1. a) Write a program for 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 Chart

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 - Weak**

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 3 | 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 |

**Objectives** : This introductory course input is intended

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

- To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.

- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

Unit I:

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

Unit II:

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha.
Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the 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.

## Unit III:

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

**- Human Relationship :** Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; **Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.**

Understanding the meaning of Vishwas; Differencebetween 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!

## Unit IV:

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

## Unit V:

**Implications of the above Holistic Understanding of Harmony on Professional Ethics :** Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly andeco- friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order: At the level of individual: as socially and ecologically responsible engineers, technologists and managers At the level of society: as mutually enriching institutions and organizations

## TEXT BOOKS

R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

Prof. KV Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications,3rd Edition.

## REFERENCE BOOKS

Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA

E.F. Schumacher, 1973, Small is Beautiful: a study of economics asif people mattered, Blond & Briggs, Britain.

A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.

Sussan George, 1976, How the Other Half Dies, Penguin Press.Reprinted 1986, 1991

PL Dhar, RR Gaur, 1990, Science and Humanism, CommonwealthPurblishers.

A.N. Tripathy, 2003, Human Values, New Age International Publishers.

Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.

Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William

W. Behrens III, 1972, Limits to Growth – Club of Rome's report,UniverseBooks.

E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press

M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethichs (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

## Relevant CDs, Movies, Documentaries & Other Literature:

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

**Pre-Requisites:**

## Module 1: Single Random variables

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

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**

**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

**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

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.

**Text Books**

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
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**

**Pre-Requisites:** Nill

**Module 1:**

**Unit-1: Introduction:**

Objectives, Principles and Classification of Surveying, Scales, Shrinkage of Map, Conventional Symbols and Code of Signals, Surveying Accessories, Phases of Surveying.

**Unit-2: Linear Measurements:**

Approximate Methods, Direct Methods- Chains- Tapes, Ranging, Tape Correction, Errors and Obstacles in Chaining.

**Unit-3: Angular Measurements:**

Compass, Bearings, Included Angles, Local Attraction, Magnetic Declination, and Dip.

**Module 2:**

**Unit-1: Levelling and Contouring:**

Types of levels and Levelling staves, Temporary Adjustments, Methods of levelling, Booking and Determination of levels, Effect of Curvature of Earth and Refraction. Characteristics and uses of Contours, Methods of Contour surveying.

**Unit-2: Areas and Volumes:**

Determination of Areas consisting of Irregular Boundary and Regular Boundary. Determination of Volume of Earth work in cutting and embankments for level section, Volume of Borrow pits, Capacity of Reservoirs.

**Unit-3: Principles of Plane Table Survey**:

Principles, Adjustment, Working operations, Methods of Plane Table surveying, Two-point problem, Three-point problem.

**Module 3:**

**Unit-1: Theodolite Surveying:** Types of Theodolites, Fundamental Lines, Temporary Adjustments, Measurement of horizontal angle by Repetition Method and Reiteration Method, Measurement of vertical angle, Trigonometrical levelling when base is accessible and inaccessible. Methods of Traversing, Traverse Computations and Adjustments, Omitted measurements.

**Unit-2: Tachometric Surveying:**

Principles of Tachometry, Stadia and Tangential Methods of Tachometry.

**Module 4:**

**Unit-1: Setting Out Curves:**

Elements of simple and compound curves, Method of setting out, elements of reverse curve, Transition curve, length of curve, elements of transition curve, vertical curves. Types of Curves and their necessity, Simple curves, Elements of Compound, Reverse, Transition and Vertical Curves.

## Module 5:
### Unit-1: Total Station:
Introduction, advantages, Fundamental quantities measured, Parts and accessories, working principle, on board calculations, Fi4eld procedure, Errors and Good practices in using Total Station.

### Unit-2: Global positioning System:
Introduction, Types of GPS and uses.

### Unit-3:
Introduction: Astronomical Surveying & Hydrographic Surveying.

### Text Books:
1. "Plane Surveying and Higher Surveying" by Chandra A M New age International Pvt. Ltd., Publishers, New Delhi, 3rd Edition Jan 2014.
2. "Surveying (Vol – 1 & 2), by Duggal S K Tata McGraw Hill Publishing Co. Ltd. New Delhi. 12th Edition oct 2016.

### Reference Books:
1. "Elements of Plane Surveying" by Arthur R Benton and Philip J, Taety McGraw Hill Publishers, New Delhi, 13th Edition Jan 2010.
2. "Surveying and levelling" by R. Subramanian, Oxford university press, New Delhi, 9th Edition, oct 2012.

### E resources
1. https://nptel.ac.in/courses/105/104/105104101/
2. https://nptel.ac.in/courses/105/107/105107122/
3. https://nptel.ac.in/courses/105/104/105104100/

### Course Outcomes:
On completion of the course, the students will be able to:
1. **Apply** the basic principles of chain surveying.
2. **Evaluate** survey data and compute areas and volumes, levels by different type of equipment and relate the knowledge to the methodologies.
3. **Apply** the measurements of angles, distances, and levels.
4. **Design** simple and compound Curves for highways.
5. **Illustrate** on advanced technology like Hydrographic Surveying, Electronic Distance Measurement, Global Positioning System, Photogrammetry and Remote Sensing

## CO-PO/PSO Mapping Chart

### (3/2/1 indicates strength of correlation)

### 3 – Strong; 2 – Medium; 1 – Weak

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 3 | 3 | 1 | - | 1 | - | - | - | - | - | - | 2 | 2 | 1 |
| CO2 | 3 | 3 | 2 | - | 1 | - | - | - | - | - | - | 3 | 3 | 1 |
| CO3 | 3 | 3 | 1 | - | 1 | - | - | - | - | - | - | 3 | 2 | 1 |
| CO4 | 2 | 2 | 2 | - | 1 | - | - | - | - | - | - | 2 | 3 | 1 |
| CO5 | 2 | 2 | 1 | - | 3 | - | - | - | - | - | - | 3 | 2 | 1 |
| Average | 2.6 | 2.6 | 1.4 | - | 1.4 | - | - | - | - | - | - | 2.6 | 2.4 | 1 |

| AY: 2022-23<br>Onwards | **J. B. Institute of Engineering and Technology**<br>(UGC Autonomous) | **B. Tech CE**<br>**II Year-I Sem** | | | |
|---|---|---|---|---|---|
| Course Code:<br>**L211B** | **BUILDING MATERIALS,<br>CONSTRUCTION AND SERVICES** | L | T | P | D |
| Credits: 2 | | **2** | **0** | **0** | **0** |

**Pre-Requisites:** Nill

## Module 1:

### Unit-1: Stones and Bricks:

Building stones, classification of building stones, quarrying procedures, structural Requirement, dressing, and tools for dressing of stones. Bricks-Composition of brick earth, manufacturing of brick, structural requirements, field and lab test. AAC blocks-Other types of building blocks.

### Unit-2: Tiles:

Types of tiles, manufacturing of tiles, structural requirements of tiles.

**Unit-3**: New construction materials ceramics - sustainable and eco-friendly materials, nano materials.

## Module 2:

### Unit-1: Cement and Admixtures:

Cement, Lime-Various ingredients of lime, constituents of limestone and classification of lime, manufacturing of lime. Mineral admixtures, chemical admixtures.

### Unit-2: Ferrous Metals and Nonferrous Metals:

Types, properties and uses and advantages of ferrous metals and non-ferrous metals.

### Unit-3: Alloys:

Types, properties and uses - aluminum alloys, copper alloys and steel alloys.

## Module 3:

Structure, types of wood, properties of wood, seasoning, defects, alternative material for wood. Glass Types of glasses, manufacturing of glass. Paints-Constituents of paints, types of paints.

### Unit-2: Building Components:

Building Components: Lintel, arches, staircase, floors, roofs, foundation, and damp-proof course. Joinery-Doors, windows, materials, and types.

## Module 4:

### Unit-1: Masonry, Wall Elements and Formwork:

Brick masonry: Types, bonds. Stone Masonry: Types, composite masonry, concrete reinforced bricks, and glass -reinforced brick. Finishing slope: plastering, pointing, and cladding- Types of ACP (Aluminium composite panel), High pressure laminations, composites - FRP, wall panelling elements -Types of roof sheeting - cold formed & light gauge steel.Formwork: requirements, standards, scaffolding, shoring, under pinning

## Module 5:

### Unit-1: Building Services:

Introduction to MEP (Mechanical electrical plumbing), Plumbing services, water distribution, sanitary lines and fittings, ventilators, functional requirements, systems of ventilators, air conditioning essentials and types, acoustics, lifts, escalators. characteristics-Absorption, fire protections, fire hazards, classification of fire resistance materials and construction.

### Text Books

1. "Building materials and Construction" by Rangwala, Sushil Kumar, Bindra, kamala Standard Publishers, 33rd edition, Jan 2019.
2. "Building Construction", by B C Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications (P) Ltd., New Delhi, 11th Edition, 2016.

### REFERENCES:

1. "Construction Technology" Vol. – 1 & 2, by R. Choudly 2nd Edition, Longman, UK, 1987.
2. "Building Construction", by P C Varghese, Prentice Hall of India Private Ltd., New Delhi, 2nd Edition, 2007.
3. National Building Code of India, 2006.
4. "Advance in Building Materials and construction", CBRI Rookie.

### E-Resources

1. https://nptel.ac.in/courses/105/102/105102088/
2. https://www.mepcentre.com/course/fire-protection-design
3. https://nptel.ac.in/courses/124/105/124105013/

### Course outcomes:

On completion of the course, the students will be able to:
1. **Identify** various building materials and select suitable type for given situation.

2. **Gain** Knowledge on different properties of building materials.
3. **Compare** the different types of doors, windows, roofs, staircase used in building works.
4. **Explain** different types of masonries and their applications.

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 2 | 1 | 2 | - | - | - | 2 | 2 | 1 | - | - | 2 | 2 | - |
| CO2 | 2 | 1 | 2 | - | - | - | 3 | 2 | 1 | - | - | 2 | 2 | - |
| CO3 | 2 | 1 | 2 | - | - | - | 1 | 2 | 1 | - | - | 2 | 2 | - |
| CO4 | 2 | 1 | 3 | - | - | - | 3 | 3 | 1 | - | - | 3 | 3 | - |
| CO5 | 3 | 2 | 3 | - | - | - | 3 | 3 | 1 | - | - | 3 | 3 | - |
| Average | 2.2 | 1.2 | 2.4 | - | - | - | 2.4 | 2.4 | 1 | - | - | 2.4 | 2.4 | - |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 – Weak**

**Pre-Requisites:** Engineering Mechanics

**Module 1:**

## Unit-1: Stresses and Strains:

Concepts of stress and strain - Stress and Strain Diagram - Elasticity and plasticity – Types of stresses and strains- Generalized Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Elastic constants and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

Unit-2: Strain Energy:

Strain Energy – Resilience – Gradual, sudden, and impact loadings – simple applications.

**Module 2:**

**Unit-1: Shear Force & Bending Moment:** Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, sign conventions, relationship between intensity of loading, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to point load, uniformly distributed load, uniformly varying load, couple, and their combinations.

**Module 3:**

## Unit-1: Bending Stresses:

Theory of simple bending – Assumptions – Derivation of bending equation- Section Modulus Determination of flexural/bending stresses of rectangular and circular sections (Solid and Hollow), I, T and Channel sections – Design of simple beam sections.

## Unit-2: Shear Stresses:

Derivation of formula for shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, I, T and channel sections

**Module 4:**

## Unit-1: Slope and Deflection of Beams:

Analytical Methods: Slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, uniformly varying load and couple.

## Unit-2: Geometrical methods:

Moment area method and conjugate beam methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, uniformly varying load and couple.

**Module 5:**

## Unit-1: Principal Stresses and strains:

Normal and tangential stresses on a plane element, their transformation to a different coordinate axes in the same plane, principal stresses & strains.

## Unit-2: Mohr's Circle:

Analytical and graphical solution technique. Mohr's circle of stresses and strains

## Text Books

1. "Strength of Materials" Vol – I & II, Elementary theory and problems, by S.Timoshenko. 3rd edition Jan 2015.
2. "Mechanics of Materials" by C. Ferdinand, P. Beer & E. Russell Johnston Jr & John T. Dewolf & David F. Mazurek. 6th edition Apr 2018.

## Reference Books

1. "Mechanics of material" by R.C.Hibbeler, Printice Hall publications. 4th edition Jan 2014.
2. "Engineering Mechanics of Solids" by EgorP. Popov, Printice Hall publications. 2 nd edition 2015.
3. "Strength of Materials" Vol –I & II by S S Bhavikatti, Vikas Publications, 4th edition, Oct 2010.

## E-Resources

1. http://www.aboutcivil.org/solid-mechanics.html
 2. https://nptel.ac.in/courses/112/106/112106141/
 3. http://nptel.ac.in/courses/105105108/

## Course Outcomes:

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

1. Analyze stress, strain, elasticity, and the relation between all elastic constants for homogeneous, isotropic materials.
2. Solve the shear force and bending moment for basic types of Beams.
3. Analyze Bending Stresses and Shear Stresses of beam section.

4. Analyze Slope and Deflection of Beams using Analytical methods & Geometrical methods.

5. Analyse stress at a point in 2 dimensions and draw Mohr's circle for stress at a point.

## CO-PO/PSO Mapping Chart

### (3/2/1 indicates strength of correlation)

### 3 – Strong; 2 – Medium; 1 – Weak

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 2 | 3 | - | - | - | - | - | - | - | - | - | 2 | 1 | - |
| CO2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | 1 | - |
| CO3 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 2 | - |
| CO4 | 2 | 3 | - | - | - | - | - | - | - | - | - | 2 | 1 | - |
| CO5 | 2 | 2 | - | - | - | - | - | - | - | - | - | 2 | 1 | - |
| Average | 2 | 2.4 | 0.6 | - | - | - | - | - | - | - | - | 2 | 1.2 | - |

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | **B. Tech CE** **II Year-I Sem** | | | |
|---|---|---|---|---|---|
| Course Code: **L211D** | **FLUID MECHANICS** | L | T | P | D |
| Credits: 3 | | **3** | **0** | **0** | **0** |

**Pre-Requisites:** NILL

## Module 1:

### Unit-1: Introduction:

Purpose of study of fluid mechanics for design and operation of engineering systems in the fields of Civil Engineering and its allied branch of Engineering, Fundamental difference between a solid and fluid, constituent relationships for solids and fluids, conservation principles applied in fluid mechanics. Definition of Fluid, difference between Ideal fluid and Real fluid, concept of Fluid Continuum.

### Unit-2: Fluid properties:

Density, Specific weight, Specific gravity, Specific volume, Viscosity, Capillarity, Vapor pressure, Compressibility, Surface tension, Cohesion and Adhesion.

### Unit-3: Fluid Statics:

Pressure at a point, Pascal's Law, Hydrostatic Law, Measurement of Pressure, Atmospheric, Gauge and Absolute pressures, Manometers - Principle of Manometry, Piezometer, U-tube differential manometer, Inverted differential manometer, Mechanical gauges - Bourdons tube pressure gauge, Hydrostatic forces on Submerged plane and Curved surfaces, Total pressure and Center of pressure.

### Unit-4: Buoyancy and Floatation:

Archimedes principle, Stability of floating and submerged bodies. Metacenter, Metacentric height.

## Module 2:

### Unit-1: Fluid Kinematics:

Introduction, Velocity of fluid particles, Classification of fluid flows, Description of the flow pattern, Acceleration of Fluid particle. Continuity equation in one, two- and three-dimensional flow, Circulation and Vorticity, Rotational and Irrotational flow, Conditions for irrotational flow, Velocity potential and Stream function, streamlines, Equipotential lines and Flow Nets.

## Module 3:

### Unit-1: Fluid Dynamics:

Forces causing motion, Euler's equation of motion and its integration, Bernoulli's equation, Linear momentum equation, Application of Linear momentum equation, Forces on pipe bend.

**Unit-2: Flow measurements**

Venturi meter, Orifice meter, Pitot tube, Orifices, Mouthpieces, Notches and Weirs.

## Module 4:

**Unit-1: Flow Through Pipes:**

Energy losses in pipes - Major and Minor losses - Expression for head loss due to Friction – Darcy's Weisbach equation, Expressions for head loss due to Pipe Expansion and Pipe Contraction, Hydraulic Gradient and Total Energy Lines, Pipes in Series and parallel, Equivalent pipe, Power transmission through pipes. Design of Pipeline Networks by Hardy Cross and Equivalent Pipe Methods.

**Unit-2: Water Hammer in Pipes:**

Water hammer phenomenon, Gradual and sudden closure of valves, Expression for pressure rise considering elasticity of pipe and fluid, Pressure relieving devices.

## Module 5:

**Unit-1: Laminar Flow:**

Characteristics of Laminar flow, Reynolds experiment, Critical Reynold's number, Critical velocity, Steady laminar flow through a circular pipe, Hagen Poiseuille equation.

**Unit-2: Turbulent flow in Pipes:**

Characteristics of Turbulent flow, Shear stress due to Turbulence, Reynolds stresses, Prandtl's mixing length theory, Universal velocity distribution law near a solid boundary, Smooth and Rough boundaries, Nikuradse's experiment, Karman – Prandtl resistance equations, Variation of friction factor with Reynold's number – Moody's Chart.

**Text Books:**
1. "Fluid Mechanics" by Victor Streeter and E. Benjamin Wylie, K.W.Bedford, McGraw Hill, 9th Edition, 2017.
2. "Hydraulics and Fluid Mechanics Including Hydraulic Machines" by P. N. Modi and M. Seth, ", Standard Book House, Raj sons Publications Private Limited, 21st edition 2017.
3. "Fluid mechanics and Hydraulic Machines" by D.S Kumar, Sk.kataria and sons publications New Delhi 2009.

**Reference Books:**
1. 'Fluid Mechanics including Hydraulic Machines" by A.K. Jain,", Khanna

Publications, 2010

2. "Fluid Mechanics" by M Frank White, Tata McGraw Hill, New Delhi, Seventh Edition, 2015.

**E-Resources**

https://nptel.ac.in/courses/105/103/105103192/

**Course Outcomes:**

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

1. **Describe** the properties of a fluid and analyze the hydro static forces on plane and curved surfaces.
2. **Discuss** the various aspects of Fluid kinematics.
3. **Formulate** equations based on conservation of mass, energy and momentum and analyse forces on nozzles and describe devices use for discharge.
4. **Compute** Reynolds number formulates equations for laminar and turbulent flow through pipes and water hammer in pipes.
5. **Describe** and solve the problems on Laminar and Turbulent flows

| CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 – Weak | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Course Outcomes (COs)** | **Program Outcomes (POs)** | | | | | | | | | | | | **Program Specific Outcomes*** | |
| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | **PO 12** | **PSO 1** | **PSO 2** |
| **CO1** | 3 | 2 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO2** | 2 | 3 | - | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO3** | 1 | 3 | - | - | - | - | - | - | - | - | - | - | 3 | - |
| **CO4** | 1 | 3 | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO5** | - | - | 1 | 1 | - | - | - | - | - | - | - | - | 3 | - |
| **Average** | 1.4 | 2.2 | 0.2 | 0.2 | - | - | - | - | - | - | - | 0.4 | 1.2 | - |

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | | **B. Tech CE** **II Year-I Sem** | | | |
|---|---|---|---|---|---|---|
| Course Code: **L211E** | **ENGINEERING GEOLOGY** | | L | T | P | D |
| Credits: 2 | | | **2** | **0** | **0** | **0** |

**Pre-Requisites:** Nill

## Module 1:

### Unit-1: Introduction to Geology

Different branches of Geology and the Importance of geology from Civil Engineering point of view. Case Studies on some of failure Civil Engineering constructions due to geological drawbacks.

### Unit-2: Mineralogy

Introduction and Importance of minerals. Different methods to identify minerals. Physical properties of following common rock forming minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite Garnet, Talc and Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite.

## Module 2:

### Unit-1: Petrology

Importance of Petrology from Civil Engineering point of view. Weathering of Rocks. Weathering process of granite. Geological classification and Common structures and textures of rocks. Megascopic study of following rocks Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sandstone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

## Module 3:

### Unit-1: Structural Geology

Introduction to Structural Geology, Indian stratigraphy, geological time scale**,** out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints - their important types and their case studies.

### Unit-2: Rock Mechanics

Sub surface investigations in rocks and engineering characteristics and Structural geology of rocks. Classification of rocks, Field & laboratory tests on rocks, Stress

deformation of rocks, Failure theories and shear strength of rocks, bearing capacity of rocks.

## Module 4:
### Unit-1: Geological Hazards
Earthquakes **-** Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides**-**Causes and effects. Measures to be taken to prevent their occurrence. Land Subsidence and Environmental Geology.
### Unit-2: Geophysical Studies and Ground water
Importance of Geophysical Studies. Geophysical methods-Gravity methods, Magnetic methods, Electrical methods, Seismic methods, Radio metric methods and geothermal method. Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement and ground water exploration.

## Module 5:
### Unit-1: Geological Considerations in Civil Engineering Structures
Dam types and geological considerations in the selection of dam site. Case Studies on dam failures due to geological draw backs. Factors contributing to the success of a reservoir. Geological factors influencing water tightness and life of reservoirs
### Unit-2: Tunnelling:
Purpose of tunnelling, Effects of Tunnelling on the ground, Role of Geological Considerations (i.e. Litho logical, structural, and ground water) in tunnelling over break and lining in tunnels. Grouting methods.

### Text Books:
1. "Engineering Geology" by N. Chennakesavulu, McMillan, India Ltd, 4$^{th}$Edition Oct 2005
2. "Principles of Engineering Geology" by K.V.G.K Gokhale- B.S. Publications, 3$^{rd}$ Edition Jan 2010.

### Reference Books:
1. "Engineering Geology" by P C Varghese, PHI Learning Private limited, 2$^{nd}$ Edition Dec 2012
2. "Engineering Geology" by S K Duggal, H K Pandey Mc Graw Hill Education Pvt Ltd, 2$^{nd}$ Edition Nov 2014.

### E-Resources
1. http://nptel.ac.in/courses/105105106/

2. http://www.geologypage.com/

**Course Outcomes:**

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

1. **Perform** Site characterization to collect, analyze, and report geologic data using Standards in engineering practice.
2. **Evaluate** the fundamentals of the engineering properties of Earth materials and fluids.
3. **Analyze** Rock mechanics characterization and ground water applications.
4. **Examine** geological hazards and mitigation methods.
5. **Identify** geological aspects in planning and construction of major Civil Engineering project

| **CO-PO/PSO Mapping Chart** | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **(3/2/1 indicates strength of correlation)** | | | | | | | | | | | | | | |
| **3 – Strong; 2 – Medium; 1 – Weak** | | | | | | | | | | | | | | |
| **Course Outcomes (COs)** | **Program Outcomes (POs)** | | | | | | | | | | | | **Program Specific Outcomes*** | |
| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | **PO 12** | **PSO 1** | **PSO 2** |
| **CO1** | 3 | - | - | 2 | - | 1 | - | - | - | - | - | 1 | 1 | - |
| **CO2** | 3 | - | 2 | 2 | - | 1 | - | - | - | - | - | 1 | 1 | - |
| **CO3** | 2 | - | - | 1 | - | 1 | - | - | - | - | - | 1 | 1 | - |
| **CO4** | 2 | - | - | 2 | - | 2 | - | 1 | - | - | - | 1 | 1 | - |
| **CO5** | 2 | - | - | - | - | 2 | - | 1 | - | - | 2 | 2 | 1 | 2 |
| **Average** | 2.4 | - | 0.4 | 1.4 | | 1.4 | | 0.4 | | | 0.4 | 1.4 | 1 | 0.4 |

**Pre-requisite:** Nill

**EXPERIMENT 1:** Surveying of an Area by Chain Survey (closed traverse) & Plotting.

**EXPERIMENT 2:** Determination of Distance between two inaccessible points with Compass.

**EXPERIMENT 3:** Survey of a given Area by Prismatic Compass (closed traverse) and plotting after adjustment.

**EXPERIMENT 4:** Radiation method, Intersection methods by Plane Table Survey.

**EXPERIMENT 5:** Levelling- Plotting of Longitudinal and Cross-section.

**EXPERIMENT 6:** Height and Distances using principles of Tachometric Surveying.

**EXPERIMENT 7:** a) Measurement of Horizontal angle and vertical angle.

b) Measurement of distance between inaccessible Theodolite.

**EXPERIMENT 8:** Determine of area using total station.

**EXPERIMENT 9:** Determination of remote height using total station.

**EXPERIMENT 10:** Curve setting using total station.

**EXPERIMENT 11:** Contouring using total station.

**EXPERIMENT 12:** Finding position of stations using G.P.S.

**Note:** At least any Ten (10) experiments have to be conducted out of available Twelve (12) experiments.

**Course Outcomes:**

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

1. **Apply** the basic principles of Engineering surveying for linear and angular measurements.
2. **Describe** the survey data and compute areas and volumes, levels by different type of equipment and relate to the methodologies.
3. **Apply** the knowledge to calculate angles, distances, and levels.
4. **Complete** comprehend the field procedures required for a professional surveyor.
5. **Use** techniques, skills, and modern engineering tools necessary for engineering practice

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 3 | 3 | 1 | - | 1 | - | - | - | - | - | - | 2 | 2 | 1 |
| CO2 | 3 | 3 | 2 | - | 1 | - | - | - | - | - | - | 3 | 3 | 1 |
| CO3 | 3 | 3 | 1 | - | 1 | - | - | - | - | - | - | 3 | 2 | 1 |
| CO4 | 2 | 2 | 2 | - | 1 | - | - | - | - | - | - | 2 | 3 | 1 |
| CO5 | 2 | 2 | 1 | - | 3 | - | - | - | - | - | - | 3 | 2 | 1 |
| Average | 2.6 | 2.6 | 1.4 | - | 1.4 | - | - | - | - | - | - | 2.6 | 2.4 | 1 |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 - Weak**

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | **B. Tech CE** **II Year – I Sem** | | | |
|---|---|---|---|---|---|
| Course Code: **L2112** | **STRENGTH OF MATERIALS LAB** | L | T | P | D |
| Credits: 1 | | 0 | 0 | 2 | 0 |

**Pre-Requisites:** Engineering Mechanics

### EXPERIMENT LIST

**EXPERIMENT 1 :** Tension test.
**EXPERIMENT 2 :** Bending test on steel (Simply supported beam and Cantilever beam).
**EXPERIMENT 3 :** Continuous beam – Deflection test.
**EXPERIMENT 4 :** Bending test on wooden and concrete beams.
**EXPERIMENT 5 :** Torsion test.
**EXPERIMENT 6 :** Hardness test (Brinell and Rockwell).
**EXPERIMENT 7 :** Spring test.
**EXPERIMENT 8 :** Compression test on wood and concrete.
**EXPERIMENT 9 :** Compression test on brick.
**EXPERIMENT 10:** Impact test (Izod and Charpy).
**EXPERIMENT 11:** Shear test.
**EXPERIMENT 12:** Use of electrical resistance strain gauges.

**Note**: At least any **Ten (10)** experiments have to be conducted out of available **Twelve (12)** experiments.

**Course Outcomes**:
On completion of the course, the students will be able to
1. **Examine** the mechanical properties of structural materials.
2. **Illustrate** the techniques, skills and modern engineering tools necessary for engineering.
3. **Evaluate** the professional and ethical responsibility in the areas of material testing.
4. **Compare** the various strength parameters of Wood and Concrete.
5. **Analyse** the Hardness and tensile strength of given specimen.

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 2 | 1 | - | 3 | 1 | - | - | - | - | - | - | 2 | 1 | - |
| CO2 | 2 | 1 | - | 3 | - | - | - | - | - | - | - | 2 | 2 | - |
| CO3 | 2 | 1 | - | 3 | 1 | - | - | - | - | - | - | 2 | 1 | - |
| CO4 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | 1 | - |
| CO5 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | 1 | - |
| Average | 2 | 1.4 | - | 2.4 | 0.4 | - | - | - | - | - | - | 2 | 1.2 | - |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 - Weak**

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | | B. Tech II Year-II Sem | | |
|---|---|---|---|---|---|
| Course Code: **L22EA** | **Business Economics and Financial Analysis** | L | T | P | D |
| Credits: **4** | | **3** | **1** | **0** | **0** |

## UNIT-I:

### Introduction to Business and Economics:

**Business**: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

**Economics**: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

## UNIT-II:

### Demand and Supply Analysis:

**Elasticity of Demand**: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.
**Supply Analysis**: Determinants of Supply, Supply Function & Law of Supply.

## UNIT-III:

### Production, Cost, Market Structures & Pricing:

**Production Analysis:** Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.
**Cost analysis:** Types of Costs, Short run and Long run Cost Functions.

**Market Structures:** Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.
**Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

### UNIT-IV:

**Financial Accounting:** Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

### UNIT-V:

**Financial Analysis through Ratios:** Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).
Introduction to Fund Flow and Cash Flow Analysis (simple problems).

### TEXT BOOKS:

D.D. Chaturvedi, S.L. Gupta, Business Economics - Theory and Applications, International BookHouse Pvt. Ltd. 2013.

Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.

Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGrawHill Education Pvt. Ltd. 2012.

### REFERENCE BOOKS:

Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.

S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, VikasPublications, 2013.

**Pre-Requisites:**

## Module –I   Solutions of Non-linear Systems

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

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 **i**nterpolation, Central difference interpolation formulae, Gauss's central difference formulae and Lagrange's interpolation formulae.

### Module 3: Numerical Differentiation and Integration

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 methodsTrapezoidal 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

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

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

### Text Books

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, 42ndedition 2012
2. Advanced Engineering Mathematics by Jain and S.R.K. Iyangar, 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

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 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| **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**

**Pre-Requisites:** Engineering Drawing

## Module 1:

### Unit1: Flow in Open Channels:

Distinction between Pipe flow and Channel flow, Characteristics of open channels, Classification of flow, Manning's and Chezy's equations, Most economical cross sections of channels - Rectangular, Trapezoidal, Triangular and Circular shapes, Velocity distribution in channel section.

### Unit-2: Non-Uniform Flows:

Energy concepts in open channel flow, Specific Energy curve, Critical depth, and Critical velocity, Condition for Critical, Subcritical and Super critical flows. Hydraulic jump - expressions for depth of Hydraulic jump and Loss of energy due to Hydraulic jump. Channel transitions, Equation for gradually varied flow, Classification of surface profiles, Rapidly varied flow.

## Module 2:

### Unit 1: Boundary Layer Theory:

Concept of Boundary layer, Boundary layer growth over a flat plate, Boundary layer thickness, Displacement thickness, Momentum thickness and Energy thickness, Laminar and Turbulent boundary layers, Integral momentum equation for boundary layer, Separation of Boundary layer and its Control.

### Unit-2: Fluid Flow around Submerged Bodies:

Drag and Lift - Basic concepts and expressions, drag and lift forces on Sphere and Cylinder.

## Module 3:

### Unit1: Dimensional Analysis:

Dimensions and Dimensional Homogeneity, Dimensional analysis by Rayleigh's method and Buckingham's Theorem, Dimensionless numbers and their consequences in Fluid Mechanics.

### Unit 2: Model Analysis:

Forces Influencing Hydraulic phenomena, Types of Similarities, Model Analysis, Similitude studies and Modeling, Classification of Models, Model Laws - Reynolds and Froude's Model laws.

## Unit 3: Basics of Turbo Machinery:
Impact of Jets - Force exerted by a liquid jet on a stationary and moving body (only flat plates and curved vanes).

## Module 4:
### Unit 1: Hydroelectric power plant:
Layout of Typical Hydro power plant installations, Heads and Efficiencies, Classification of Hydropower plants – Definition of terms – load factor, utilization factor, capacity factor, estimation of hydropower potential.

### Unit 2: Hydraulic Turbines:
Classification - Impulse and Reaction turbines, Pelton, Francis and Kaplan turbines Specific speed, Draft tube, Cavitation, unit quantities, Geometric similarity Characteristic curves and Selection of turbines.

## Module 5:
### Unit 1: Pumps:
Introduction, Centrifugal pump - Heads and Efficiencies, Specific sped, characteristic curves, Net positive suction head, Priming, Selection and Operational difficulties.

### Unit 2: Reciprocating pump:
Single and Double acting Reciprocating pumps, Coefficient of discharge and Slip, Use of Air vessels and Characteristic curves.

### Text Books:
1. "Hydraulics and Fluid Mechanics Including Hydraulic Machines" by P. N. Modi and M. Seth, ", Standard Book House, Raj sons Publications Private Limited, 21st edition 2017.
2. "Fluid mechanics and Hydraulic Machines" by Ds Kumar, Sk.kataria and sons publications New Delhi 2009.

### Reference Books:
1. "Open Channel Hydraulics" by VenTeChow, McGraw-Hill Black burn press illustrated reprint, 2009.
2. "Fluid Mechanics" by Victor Streeter and E. Benjamin Wylie, K.W.Bedford McGraw Hill, 9th Edition, 2017.

### E-Resources:
1. https://nptel.ac.in/courses/105/103/105103096/
2. https://nptel.ac.in/courses/112/103/112103249/

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

1. **Identify** the most economical channel section.
2. **Explain** the boundary layer concept.
3. **Discuss** and solve dimensional analysis and Model study problems.
4. **Demonstrate** the characteristic curves of turbines.
5. **Demonstrate** the characteristic curves of pumps.

<table>
<tr><td colspan="16"><strong>CO-PO/PSO Mapping Chart</strong><br><br><strong>(3/2/1 indicates strength of correlation)</strong><br><br><strong>3 – Strong; 2 – Medium; 1 - Weak</strong></td></tr>
<tr><td rowspan="2"><strong>Course Outcomes (COs)</strong></td><td colspan="12"><strong>Program Outcomes (POs)</strong></td><td colspan="2"><strong>Program Specific Outcomes*</strong></td></tr>
<tr><td><strong>PO 1</strong></td><td><strong>PO 2</strong></td><td><strong>PO 3</strong></td><td><strong>PO 4</strong></td><td><strong>PO 5</strong></td><td><strong>PO 6</strong></td><td><strong>PO 7</strong></td><td><strong>PO 8</strong></td><td><strong>PO 9</strong></td><td><strong>PO 10</strong></td><td><strong>PO 11</strong></td><td><strong>PO 12</strong></td><td><strong>PSO 1</strong></td><td><strong>PSO 2</strong></td></tr>
<tr><td><strong>CO1</strong></td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td></tr>
<tr><td><strong>CO2</strong></td><td>2</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td></td><td>-</td></tr>
<tr><td><strong>CO3</strong></td><td>3</td><td>-</td><td>2</td><td>1</td><td></td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>3</td><td>-</td></tr>
<tr><td><strong>CO4</strong></td><td>1</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>3</td><td>-</td></tr>
<tr><td><strong>CO5</strong></td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td><strong>Average</strong></td><td>1.8</td><td>0.6</td><td>0.4</td><td>0.2</td><td>0.2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>0.6</td><td>1.4</td><td>-</td></tr>
</table>

**Pre-Requisites:** Engineering Mechanics

## Module 1:

### Unit 1: Torsion

Theory of pure torsion – Derivation of Torsion equation - Assumptions made in the theory of pure torsion – Polar section modulus – Combined bending and torsion Power transmitted by shafts - Shaft of varying sections – Composite shaft – strain energy due to torsion.

### Unit 2: Springs

Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel – Carriage or leaf springs.

## Module 2:

### Unit 1: Columns and Struts

Introduction–Types of columns–Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns assumptions- derivation of Euler's critical load formulae for various end conditions– Equivalent length of a column – slenderness ratio - Limitations of Euler's theory. Rankine-Gordon's formula for columns - Long columns subjected to eccentric loading.

### Unit 2: Laterally loaded struts

struts subjected to uniformly distributed and concentrated lateral loads – Maximum B.M. and stress due lateral loading.

## Module 3:

### Unit 1: Direct and Bending Stresses

Introduction – Eccentric loading – Columns with eccentric loading – Symmetrical columns with eccentric loading about one axis and two axes. Unsymmetrical columns with eccentric loading – limit of eccentricity

## Module 4:

### Unit 1: Thin 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.

## Unit 2: Thick Cylinders

Introduction - Lame's theory for thick cylinders – Derivation of Lame's formulae – distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders – Necessary difference of radii for shrinkage.

**Module 5:**

## Unit 1: Unsymmetrical bending

Introduction – Centroidal principal axes of section – Graphical method for locating principal axes – Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid – Location of neutral axis - Deflection of beams under unsymmetrical bending.

Unit 2: Shear Centre Introduction - Shear Centre for symmetrical and unsymmetrical (channel, I, T and L) sections

## Text Books

1. "Strength of Materials" Vol – I & II, Elementary theory and problems, by S.Timoshenko. 3rd edition Jan 2015.
2. "Mechanics of Materials" by C. Ferdinand, P. Beer & E. Russell Johnston Jr & John T. Dewolf & David F. Mazurek. 6th edition Apr 2018.
3. "Strength of Materials" Vol –I & II by S S Bhavikatti, Vikas Publications, 4th edition, Oct 2010.

## Reference Books

1. "Mechanics of material" by R.C.Hibbeler, Printice Hall publications. 4th edition Jan 2014.
2. "Engineering Mechanics of Solids" by EgorP. Popov, Printice Hall publications. 2 nd edition 2015.

## E-Resources

1. http://www.aboutcivil.org/solid-mechanics.html
2. https://nptel.ac.in/courses/112/106/112106141/
3. http://nptel.ac.in/courses/105105108/

## Course Outcomes:

On completion of the course, the students will be able to:
1. Explain the concepts and principles of theory of torsion.
2. Evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for all types of loading conditions.

3. Analyze the strength and stability of structural members subjected to direct and bending stresses.

4. Evaluate the shear center and unsymmetrical bending.

5. Analyze the thin and thick cylinders

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 2 | 3 | - | - | - | - | - | - | - | - | - | 2 | 1 | - |
| CO2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | 2 | - |
| CO3 | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| CO4 | 2 | 1 | 2 | - | - | - | - | - | - | - | - | 1 | 1 | - |
| CO5 | 2 | 1 | 2 | 2 | - | - | - | - | - | - | - | 2 | 1 | - |
| Average | 2 | 1.8 | 1.4 | 0.4 | - | - | - | - | - | - | - | 1.4 | 1.2 | - |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 – Weak**

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | **B. Tech CE** **II Year-II Sem** | | | |
|---|---|---|---|---|---|
| Course Code: **L221C** | **CONCRETE TECHNOLOGY** | L | T | P | D |
| Credits: 3 | | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Engineering Geology, Building Materials, Construction and Services.

**Module 1:**

## Unit 1: Cement:

Types of cement, Portland cement – chemical composition – Manufacturing process– Hydration, Water requirement for hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement.

**Module 2:**

## Unit 1: Aggregates:

Classification of aggregate –Recycled Aggregates – Introduction to M-Sand and manufacturing process of M-Sand – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse aggregates – Gap graded aggregate – Maximum aggregate size.

**Module 3:**

## Unit 1: Fresh Concrete:

Workability – Factors affecting workability – Measurement of workability by different tests – Segregation & Bleeding – Setting times of concrete – Effect of time and temperature on workability –Rheology of Fresh Concrete– Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water, Admixtures: Types of admixtures – mineral and chemical admixtures. Water / Cement ratio – Abram's Law – Gel Space ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Methods of curing.

**Module 4:**

## Unit 1: Testing of Hardened Concrete:

Compression tests – Factors affecting strength – Flexure tests – Splitting tests – Pullout test (Bond Strength), Non-destructive testing methods – codal provisions for NDT. 116 Hardened Concrete: Elasticity, Creep & Shrinkage Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

**Module 5:**

## Unit 1: Mix Design:

Factors in the choice of mix proportions – Durability of concrete (Factors affecting & Measures to improve) – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

## Unit 2: Special Concretes:

Introduction to Light weight concrete – Cellular concrete – No-fines concrete (Pervious Concrete) – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete – Geopolymer Concrete – Bacterial Concrete. Introduction to Precast concrete, applications, advantages, and disadvantages.

## Text Books

1. "Properties of Concrete" by A.M.Neville – Low priced Edition – 4th edition.
2. "Concrete Technology" by M.S.Shetty – S.Chand& Co,2004.
3. "Concrete Technology" by Bhavikatti S S - I K International Publishing House Pvt. Ltd..

## Reference Books

1. "Concrete Technology" by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi.
2. "Concrete Technology" by A.R. Santha Kumar, Oxford university Press, New Delhi.
3. "Concrete: Micro structure, Properties and Materials" – P.K.Mehta and J.M.Monteiro, Mc-Graw Hill Publishers.

## E-Resources

1. https://www.cement.org/learn/concrete-technology
2.https://www.cement.org/cement-concrete-applications/how-cement-is-made
3.https://www.constrofacilitator.com/different-types-of-concrete-admixtures/
4. https://www.concretenetwork.com/aggregate/

**Course Outcomes:**

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

1. Discuss the properties of concrete ingredients i.e. cement, sand and coarse aggregate.

2. Explain the mechanical performance of cement-based materials.

3. Discuss the effects of the rheology and early age properties of concrete on its long-term behaviour.

4. Apply the usage of laboratory tests to characterize hardened concrete and its properties.

5. Explain the mix design and engineering properties of special concretes such as high-performance, self-compacting and fibre reinforced concrete, etc.

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | - | 2 | 2 | - | - | - | - | - | - | - | - | - | 2 | 2 |
| CO2 | 3 | 2 | 3 | - | - | 3 | 1 | - | - | - | - | - | 3 | 2 |
| CO3 | 1 | 2 | 3 | - | - | 2 | 1 | - | - | 2 | - | 2 | 2 | 2 |
| CO4 | 2 | 1 | 2 | - | - | 2 | - | - | - | - | - | 2 | 2 | 2 |
| CO5 | 2 | 3 | 2 | - | - | 2 | - | - | - | - | - | 2 | 2 | 2 |
| Average | 2 | 2 | 2.4 | - | - | 1.8 | 0.4 | - | - | 0.4 | - | 1.2 | 2.2 | 2 |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 – Weak**

**Pre-Requisites:** Engineering Mechanics.

## Module 1:

### Unit 1: Energy Theorems

Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem and Castigliano's second theorem -Unit Load Method. Deflections of simple beams and pin- jointed plane trusses. Deflections of statically determinate bent frames.

## Module 2:

### Unit 1: Propped Cantilever and Fixed Beams

Analysis of Propped Cantilever and Fixed beams, including the beams with varying moments of inertia, subjected to uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads- shear force and bending moment diagrams for Propped cantilever and Fixed beams, effect of sinking of support, effect of rotation of a support.

## Module 3:

### Unit 1: Continuous Beams

Introduction-Fixed Beams-Continuous beams. Clapeyron's theorem of three moments- Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang. Effects of sinking of supports.

### Unit 2: Slope Deflection Method

Introduction, Sign convention, Derivation of slope-deflection equation, application to continuous beams with and without settlement of supports. Shear force and bending moment diagrams and Elastic curve.

## Module 4:

### Unit 1: Moment Distribution Method

Introduction, Definition of terms, Development of method, Analysis of continuous

beams with support yielding. Analysis of frames with and without side sway. Shear force and bending moment diagrams and Elastic curve.

## Module 5:
### Unit 1: Kani's Method
Introduction, Basic concept, Analysis of continuous beams with and without settlement of supports, Shear force and bending moment diagrams. Elastic curve. Analysis of Single Bay-single story portal frames with and without sway. Shear force and bending moment diagrams. Elastic curve.

**Text Books:**
1. "Structural Analysis" Vol –I & II by V.N.Vazirani and M.M.Ratwani, Khanna Publishers,8th edition Nov 2015.
2. "Structural Analysis" Vol I & II by G.S.Pandit and S.P.Gupta, Tata McGraw Hill Education Pvt. Ltd.6th edition Jan 2012.
3. "Structural Analysis" Vol –I & II by S S  Bhavikatti, Vikas Publications, 4th edition, Oct 2010.

**Reference Books:**
1. "Structural Analysis" by Hibbeler, pearson Education Ltd, 9th edition Oct 2017.
2. "Structural Analysis" by by R. Vaidyanathan and P. Perumal, Naveen Publishing House. 3rd    edition, April 2017.
3. "Basic Structural Analysis" by C S Reddy, I K International Publishing House Pvt, Ltd, 4th   edition, July 2017.

**E-Resources**
1. https://nptel.ac.in/courses/105/101/105101085/
2. https://nptel.ac.in/courses/105/105/105105109/

**Course Outcomes:**
On completion of the course, the students will be able to:
1. **Analyze** the deflection of beams and trusses using Castigliano's theorems.
2. **Construct** the Shear Force and Bending Moment diagram of propped cantilever beam and fixed beam.
3. **Analyze** the continuous beam using theorem of three moment equation and slope deflection method.
4. **Determine** the moment in indeterminate beams and frames having variable moment of inertia and subsidence using moment distribution method.
5. **Construct** the bending moment diagram for beams and frames by Kani's method.

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO-PO/PSO Mapping Chart** **(3/2/1 indicates strength of correlation)** **3 – Strong; 2 – Medium; 1 – Weak** | | | | | | | | | | | | | | |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| **CO1** | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | 1 | - |
| **CO2** | 2 | 2 | 2 | - | - | - | - | - | - | - | - | 1 | 2 | - |
| **CO3** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | 1 | 1 | - |
| **CO4** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| **CO5** | 2 | 3 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| **Average** | 2.2 | 2.2 | 1.2 | - | - | - | - | - | - | - | - | 0.6 | 1.2 | - |

**Pre-Requisites:** Building Materials, Construction and Services

## LIST OF EXPERIMENTS

**EXPERIMENT 1 :** Fineness of cement and Normal Consistency.
**EXPERIMENT 2 :** Initial setting time and Final setting time of cement..
**EXPERIMENT 3 :** Soundness of Cement and Specific gravity of Cement.
**EXPERIMENT 4 :** Compressive strength of cement.
**EXPERIMENT 5 :** Workability test on concrete by compaction factor & slump cone test.
**EXPERIMENT 6 :** Workability test on concrete by Vee-bee consistometer
**EXPERIMENT 7      :** Compressive strength of concrete Cube & cylinder.
**EXPERIMENT 8 :** Modulus of elasticity of Concrete.
**EXPERIMENT 9 :** Split Tensile test of Concrete.
**EXPERIMENT 10    :** Sieve analysis & specific gravity of sand.
**EXPERIMENT 11    :** Bulking of sand.
**EXPERIMENT 12      :** Non-Destructive testing on concrete

**Note:** At least any **Ten (10)** experiments must be conducted out of available **Twelve (12)** experiments.

Course Outcomes: On completion of the course, the students will be able to:
1. **Analyze** the consistency and fineness of cement and setting times of cement.
2. **Find** the specific gravity and soundness of cement.
3. **Examine** properties of concrete material, behaviour of concrete & properties of
                     fresh & hardened concrete.
4. **Describe** destructive and non-destructive test on concrete.
5. **Examine** bulking of sand.

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 2 | - | - | - | - | - | - | - | - | 2 | - | - | - | - |
| CO2 | 3 | - | - | - | 2 | - | - | - | 2 | 2 | - | - | 2 | 2 |
| CO3 | - | 2 | - | - | - | - | - | - | 2 | 1 | - | - | 2 | 1 |
| CO4 | 1 | 3 | - | - | - | - | - | - | 2 | 2 | - | - | 1 | 2 |
| CO5 | 1 | 2 | - | - | - | - | - | - | - | - | - | - | 1 | 1 |
| Average | 0.6 | 1.4 | - | - | 0.4 | - | - | - | 1.5 | 1.4 | - | - | 1.2 | 1.2 |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 - Weak**

**Pre-Requisites:** Fluid mechanics

## LIST OF EXPERIMENTS

**EXPERIMENT 1**: Calibration of Venturi meter & Orifice meter.

**EXPERIMENT 2**: Calibration of contracted Rectangular Notch / Triangular Notch.

**EXPERIMENT 3**: Determination of Coefficient of discharge for a small orifice by constant head method.

**EXPERIMENT 4**: Determination of Coefficient of discharge for a mouthpiece by constant head method.

**EXPERIMENT 5**: Determination of friction factor of a pipe.

**EXPERIMENT 6**: Verification of Bernoulli's equation.

**EXPERIMENT 7:** Impact of jet on vanes.

**EXPERIMENT 8**: Performance test on Pelton wheel turbine.

**EXPERIMENT 9**: Performance test on Francis turbine.

**EXPERIMENT 10**: Performance characteristics of a single stage centrifugal pump.

**EXPERIMENT 11**: Performance characteristics of a multi-stage centrifugal pump.

**EXPERIMENT 12**: Performance characteristics of a reciprocating pump.

**Note:** At least any **Ten (10)** experiments must be conducted out of available **Twelve (12)** experiments.

Course Outcomes:

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

1. **Demonstrate** fluid flow principles.

2. **Apply** the knowledge in calculating performance analysis in turbines and pumps that can be used in power plants and Analyse practical problems in all power plants.

3. **Measure** discharge in pipes and Demonstrate the characteristics curves of turbines and pumps.

4. **Measure** discharge in pipes.

5. **Demonstrate** the characteristics curves of turbines

| **Course Outcomes (COs)** | **Program Outcomes (POs)** | | | | | | | | | | | | **Program Specific Outcomes\*** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | **PO 12** | **PSO 1** | **PSO 2** |
| **CO1** | 3 | 2 | - | - | - | 1 | - | - | - | - | - | 1 | 1 | - |
| **CO2** | 2 | 2 | 2 | - | - | 1 | - | - | - | - | - | - | 2 | - |
| **CO3** | 2 | 3 | - | - | - | 1 | - | - | - | - | - | - | 1 | 1 |
| **CO4** | 2 | 3 | - | - | - | 1 | - | - | - | - | - | - | - | - |
| **CO5** | 2 | 2 | 1 | - | - | 1 | - | - | - | - | - | - | 1 | - |
| **Average** | 2.2 | 2.4 | 0.6 | - | - | 1 | - | - | - | - | - | 0.2 | 1 | 0.2 |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 - Weak**

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | B. Tech CE II Year-II Sem | | | |
|---|---|---|---|---|---|
| Course Code: **L2213** | **COMPUTER AIDED CIVIL ENGINEERING DRAWING** | L | T | P | D |
| Credits: 1 | | 0 | 0 | 2 | 0 |

**Pre-Requisites:** Engineering Drawing

## LIST OF EXPERIMENTS

**EXPERIMENT 1 :** Introduction to Computer Aided Drafting.
**EXPERIMENT 2 :** To open and set up software in system.
**EXPERIMENT 3 :** Introduction and Exercise on coordinate systems.
**EXPERIMENT 4 :** Introduction and exercise on drawing commands.
**EXPERIMENT 5 :** Introduction and exercise on modify commands.
**EXPERIMENT 6 :** Introduction and exercise on Dimensions, Texting, and Layers.
**EXPERIMENT 7 :** Drawing of building components like Doors,Windows&walls
**EXPERIMENT 8 :** Drawing a plan of a given building and Dimensioning.
**EXPERIMENT 9 :** Developing Sections and Elevations from a given plan.
**EXPERIMENT 10 :** Drawing a plan of a Residential Building ,its sections and elevations.
**EXPERIMENT 11 :** Drawing a plan of a Commercial Building and its sections and elevations.
**EXPERIMENT 12 :** Introduction and Exercises on 3-D commands.

**Note:** At least any **Ten (10)** experiments must be conducted out of available **Twelve (12)** experiments.

**Course Outcomes:**
On completion of the course, the students will be able to :
1. **Memorize** different CAD commands.
2. **Develop** plans, sections, and elevations of residential and commercial buildings.
3. **Develop** different components of buildings.
4. **Develop** working drawings of buildings with detailed layout.
5. **Create** 2D and 3D drawings in AUTOCAD environment.

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 2 | 2 | 3 | - | 3 | - | - | - | - | - | - | - | 3 | 3 |
| CO2 | 2 | 2 | 2 | - | 3 | - | - | - | - | - | - | - | 2 | 3 |
| CO3 | 2 | 1 | 3 | - | 2 | - | - | - | - | - | - | - | 2 | 3 |
| CO4 | 1 | 1 | 1 | - | 1 | - | - | - | - | - | - | - | 1 | 2 |
| CO5 | 1 | - | - | - | 1 | - | - | - | - | - | - | - | 1 | 2 |
| Average | 1.6 | 1.2 | 1.8 | - | 2 | - | - | - | - | - | - | - | 1.8 | 2.6 |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 - Weak**

| 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 CE, EEE, ME, and MIE) | L | T | P | D | |
| Credits: 0 | | **2** | **0** | **0** | **0** | |

**Pre-Requisites:** Nil.

**Module 1:**
**Unit-I: Ecosystem And Natural Resources**
Concept, Classification of Resources: Water resources, Land resources, land degradation, Forest resources, Mineral resources, Energy resources. Concept of ecosystem, Classification of ecosystem, Functions of ecosystem. Biodiversity, Level, values, hotspots of biodiversity, Threats to Biodiversity, Conservation of Biodiversity.

**Module 2:**

**Unit-I: Global Environmental Problems and Global Efforts**
Deforestation, Greenhouse effect, Global Warming, Sea level rise, Ozone depletion. International conventions/protocols: green-belt-development, Concept of Green Building, Clean Development Mechanism (CDM).

**Unit-2: Environmental Impact Assessment (EIA) And Environmental Management Plan** Definition of Impact, classification of impacts, methods of baseline data acquisition. Impacts on different components: such as human health resources, air, water, flora, fauna and society, impact assessment methodologies. Environmental management plan (EMP).

**Module 3:**

**Unit-1: Environmental Policy, Legislation, Rules and Regulations**
Environmental Protection Act: Air (Prevention and control of pollution) Act-1981, Water (Prevention and control of pollution) Act-1974, Forest Conservation Act.
**Unit-2: Towards Sustainable Future**:
Concept of Sustainable Development, Threats to Sustainability, Strategies for achieving Sustainable development, Environmental Ethics, Environmental Economics, Concept of Green Computing.

**Text Books:**

1. "Textbook of Environmental Science And Technology" by M Anji Reddy, BS Publications, 2007.
2. "Principles of Environmental Science and Engineering" by Rao P. Venugopala, Prentice Hall India Learning Private Limited (1 January 2006)

**Reference Books:**

1. "Environmental Studies" by Benny Joseph, McGraw Hill Education 2008.
2. "Textbook of Environmental Studies for Undergraduate Courses" by Erach Bharucha 2005, University Grants Commission, University Press

**E-Resources**

1. https://nptel.ac.in/courses/120/108/120108004/#

**Course Outcomes:**

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

1. **Compare** the different natural resources available and how to use them.
2. **Describe** about biodiversity.
3. **Analyze** the Global Environmental Problems and Global Efforts.
4. **Categorize** the global environmental problems.
5. **Prioritize** the Sustainable development

<table>
<tr><td colspan="16" align="center"><strong>CO-PO/PSO Mapping Chart</strong><br><br><strong>(3/2/1 indicates strength of correlation)</strong><br><br><strong>3 – Strong; 2 – Medium; 1 - Weak</strong></td></tr>
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</table>

**Pre-Requisites:** Engineering Mechanics, Fluid Mechanics

**Module 1:**
**Unit 1: Introduction and Properties of soil**
Introduction, Origin and formation of soil, 3-phase soil system, volumetric relationships and weight-volume relationships. Definitions and their inter relationships. Determination of Index Properties-Specific gravity, water content, in-situ density, and particle size analysis (sieve and sedimentation analysis) Atterberg's Limits, Consistency indices, Relative density, Plasticity chart, Unified and BIS soil classification. Soil structure and Clay mineralogy.

**Module 2:**
**Unit 1: Permeability**
Permeability of soils, Darcy's law, Determination of permeability of soils, Permeability of stratified soils, Field permeability determination, Seepage velocity, Absolute coefficient of permeability, Factors affecting permeability. Effective stress principle- Effective stress under different field conditions. Seepage pressure-Quick sand condition.

**Unit 2: Seepage Analysis**
Laplace equation, assumptions, limitations, and its derivation. Flow nets, characteristics and applications.

**Module 3:**
**Unit 1: Stress distribution in soils**
Boussinesq and Westergaards theories for point loads, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical plane and horizontal plane, Newmarks influence chart for irregular areas. Contact pressure distribution in sands and clays.

**Module 4:**
**Unit 1: Compaction of Soils**
Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control, compactive effort & method of compaction. Lift thickness and number of passes, Proctor's needle, Compacting equipment's and their suitability.

**Unit 2: Consolidation of soil**
Consolidation: Types of compressibility – Immediate settlement – Primary consolidation and secondary consolidation – Stress history of clay, Normally consolidated soil, Over consolidated soil

and under consolidated soil- preconsolidation pressure and its determination- Consolidation test, Estimation of settlements -Terzaghi's 1-D consolidation theory – Coefficient of consolidation and its determination - Spring analogy.

**Module 5:**

**Unit 1**: **Shear Strength of Soil**

Definition and use of shear strength, source of shear strength- Normal and Shear stresses on a plane – Mohr's stress circle- Mohr-Coulomb failure theory. Thixotropy and sensitivity. Measurement of shear strength, Drainage conditions -Direct shear test, Triaxial shear test, Unconfined compression test and vane shear test – Factors affecting shear strength of granular soils and cohesive soils.

**Text Books:**

3. "Basic and Applied Soil Mechanics" by Gopal Ranjan & ASR Rao, New Age International Publishers, 3rd edition (Jan 2016).
4. "Soil Mechanics and Foundation Engineering".by K.R. Arora, Standard Publishers and Distributors, 7th edition (Jan 2019).

**Reference Books:**

3. "Principles of Geotechnical Engineering" by Braja M. Das, Cl engineering publishers, 9th edition (Jan 2017).
4. "Geotechnical Engineering" by Manoj Dutta & Gulati S. K, Tata McGraw-Hill Publishers,3rd edition (Jan 2011).

**E resources**

1. https://nptel.ac.in/courses/105/101/105101201/
2. https://www.btechguru.com/courses--nptel--civil-engineering--advanced-geotechnical-engineering-video-lecture--CE--CE105101001V.html

**Course Outcomes:**

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

6. Describe the origin of soil, classification of soil.
7. Identify the role of water in soil behaviour.
8. Analyze the practical problems related to soil stress.
9. Estimate the amount of compaction and consolidation of soil to increase engineering properties.
10. Evaluate the practical problems related to shear strength of soil.

| CO-PO/PSO Mapping Chart | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (3/2/1 indicates strength of correlation) | | | | | | | | | | | | | | |
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| | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | **PO 12** | **PSO 1** | **PSO 2** |
| **CO1** | 3 | 2 | - | - | - | 1 | - | - | - | - | - | 1 | 1 | - |
| **CO2** | 2 | 2 | 2 | - | - | 1 | - | - | - | - | - | - | 2 | - |
| **CO3** | 2 | 1 | - | - | - | 1 | - | - | - | - | - | - | 1 | - |
| **CO4** | 1 | 3 | - | - | - | 1 | - | - | - | - | - | - | 1 | - |
| **CO5** | 1 | 3 | 1 | - | - | 1 | - | - | - | - | - | - | 1 | - |
| **Average** | 1.8 | 2.2 | 1.5 | | | 1 | | | | | | | 1.2 | |

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | B. Tech CE III Year-I Sem | | | |
|---|---|---|---|---|---|
| Course Code: **L311B** | **STRUCTURAL ENGINEERING –I (RCC)** | L | T | P | D |
| Credits: 4 | | **3** | **1** | **0** | **0** |

**Pre-Requisites:** Strength of Materials, Concrete Technology

**Module 1:**

**Unit 1: Concepts of Reinforced Concrete:**
Design-Basic concepts of working stress method. Limit state Method-Assumptions-Material stress-strain Curves-Partial Safety Factors-Characteristic values. Concepts of under-reinforced, over-reinforced and balanced sections. Stress block parameters- Loads and Load combinations and important clauses in IS 456-2000.

**Unit 2: Beams:**
Limit state analysis and design of singly reinforced and doubly reinforced rectangular beams. Limit state analysis and design of T and L beam sections.

**Module 2:**

**Unit 1: Limit state analysis and design**:
Limit state analysis and design for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous rectangular beams, detailing.

**Module 3:**

**Unit 1:** Design of short and long columns-under axial loads, uniaxial bending and biaxial bending conditions- Design aids to IS 456- SP16 charts and provisions.

**Module 4:**

**Unit 1**: **Design of slabs & staircase:**
Design of one-way slab, Two-way slab and Continuous slab using IS Coefficients. Design of dog-legged staircase.

**Unit 2**: **Limit state of serviceability**:
Limit state of serviceability for deflection, cracking and codal provision

**Module 5:**

**Unit 1**: **Design of footings:** Different types of footings – Design of isolated footings - square, rectangular and circular footings. Design of combined footings.

Shear wall definition, structural significance and applications in multi-story buildings.

**Text Books:**
1. ''Limit state designed of reinforced concrete'' – P.C.Varghese, Prentice Hall of India, New Delhi.
2. ''Reinforced concrete design'' by S. Unnikrishna Pillai & Devdas Menon, TataMc.Graw Hill, New Delhi.

3. ''Reinforced concrete design'' by N. Krishna Raju and R.N. Pranesh, New age International Publishers, New Delhi.

**Reference Books:**
1. ''Fundamentals of Reinforced concrete design'' by M.L. Gambhir, Printice Hall of India Private Ltd., New Delhi.
2. ''Design of concrete structures'' by J.N.Bandhyopadhyay PHI Learning Private Limited.
3. ''Design of Reinforced Concrete Structures'' by I.C.Syal and A.K.Goel, S.Chand & company.
4. ''Limit state design of reinforced concrete'' by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Lakshmi Publications, Hyderabad.

**E-Resources**
1. https://nptel.ac.in/courses/105/105/105105105/
**2.** https://nptel.ac.in/courses/105/105/105105104/

**Course Outcomes:**
On completion of the course, the students will be able to:
1. Formulate the basic design constants and loadings on RC sections as per limit state method of IS 456
2. Analyze singly and doubly reinforced rectangular concrete beams using the limit state method &Design rectangular, L& T beams using IS codal provisions and show reinforcement details.
3. Design short and long columns for axial load and moments using IS code and show reinforcement details.
4. Design the one-way slab and two-way slabs, and compute deflections and crack widths for a given section and loading conditions.
5. Design isolated and combined footings and draw reinforcement details.

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<tr><td>**CO5**</td><td>1</td><td>3</td><td>1</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td></tr>
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</table>

**Module 1:**

**Unit I:** Sewage Treatment: Introduction to Sewage. Collection and Conveyance of Sewage, Wastewater flow rates, Design of Sewers, Shapes and Materials. Sewer Appurtenances, Characteristics of Sewage-cycles of Decay-Decomposition of Sewage, Examination of Sewage, BODCOD Equations.

**Unit-2:** Sewage Disposal: Drainage Components Requirements. Sanitary Fitting Traps, One Pipe and Two Pipe Systems of Plumbing, Ultimate Disposal of Sewage.

**Module 2:**

**Unit-I:** Principles and Design of Screens, Grit Chambers, Skimming Tanks, Sedimentation Tanks, Trickling Filters-Standard and High Rate.

**Unit-2:** Disposal Methods: Construction and Design of Oxidation Ponds, Sludge Digestion Tanks and The Factors That Decide the Design. Sludge Disposal by Drying, Septic Tanks and Their Working Principles and Design of Soak Pits.

**Module 3:**

**Unit-I:** Wastewater Treatment Plants and Advanced Wastewater TreatmentTreatment Plants: Site selection, plant design, Hydraulic Profiles, operation, and maintenance aspects. Advanced wastewater treatment for nutrient removal, disinfection, and polishing.

**Module 4:**

**Unit-I:** Advanced Wastewater Treatment: removal of suspended solids, dissolved solids, nitrogen removal, phosphorous removal, adsorption, refractory organics and their treatment, reuse and recycle of wastewater. Wastewater treatment from specific industries sources, characteristics, and methodology for the treatment of industrial wastewater, flow diagram for the treatment methods, sugar industry, distilleries, tannery textile and paper and pulp mills.

**Module 5:**

**Unit-I:**

**Air Pollution:** Classification and Their Effects. Meteorological Parameters Affecting Air Pollution, Atmospheric Stability. Plume Behaviour. Control of Particulates by Gravity Settlers, Cyclone Filters, Electrostatic Precipitators. Control of Gaseous Pollutants and Automobile Pollution

**Unit-II:**

**Noise Pollution:** Basic Concepts, Measurement and Various Control Methods.

**Text Books**

1. Water Supply & Sanitary Engineering by Dhanpatraj J.S. Birdie, G.S. Birdie, Publications.
2. Environmental Engineering (Vol.II): Sewege Waste Disposal and Air Pollution Engineering by, SK Garg (1999) Khanna Publications, 2018, 40th Edition.
3. Environmental Engineering, Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, McGraw Hill Education, 2017 First Indian Edition.

**Reference Books**
1. Environmental Engineering, I and II by BC Punmia, Std. Publications.
2. Wastewater Engineering, Treatment, Disposal and Reuse, Metcalf and Eddy.Tata McGraw-Hill, New Delhi.
3. Environmental Pollution and Control Engineering, CS Rao, Wiley Publications.

**E-Resources**
1. https://nptel.ac.in/courses/105/105/105105178/
2. https://nptel.ac.in/courses/105/106/105106119/

**Course Outcomes :**
On completion of the course, the students will be able to:
1. Identify the different sewage water treatment and disposal methods.
2. Explain different components of wastewater treatment plants.
3. Apply the different mode of operation and maintenance of wastewater treatment plants.
4. Apply the different modes of waste water treatment in the industry.
5. Identify the effect of the behaviour of air pollutants on the environment.

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<tr><td>CO5</td><td>2</td><td>3</td><td>-</td><td>-</td><td>-</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>2</td><td>1</td></tr>
<tr><td>Average</td><td>0.6</td><td>1</td><td>2.4</td><td>1.2</td><td>1.2</td><td>0.6</td><td>0.6</td><td>-</td><td>-</td><td>-</td><td>-</td><td>0.8</td><td>2</td><td>1</td></tr>
</table>

**Pre-Requisites:** Structural Analysis-I

## Module 1:
Unit 1: Three Hinged Arches: Introduction–Types of Arches–Comparison between Three hinged and two hinged Arches. Linear Arch. Eddy's theorem. Analysis of Three hinged arches. Geometrical properties of parabolic and circular arch. Three hinged circular arch at different levels. Normal Thrust and radial shear in an arch. Absolute maximum bending moment diagram for a three hinged arch. Effect of temperature. Analysis of two hinged archescircular and parabolic – concentrated and UDL.

## Module 2:
### Unit 1: Moving Loads:
Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load U.D load longer than the span, U.D load shorter than the span, two-point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length.
### Unit 2: Influence Lines:
Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a section - Point loads, UDL longer than the span, UDL shorter than the span- Influence lines for forces in members of Pratt and Warren trusses.

## Module 3:
### Unit 1: Flexibility Matrix Method:
Introduction, Axes and coordinates, Flexibility matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach with static indeterminacy.

## Module 4:
### Unit 1: Stiffness Matrix Method:
Introduction, Stiffness matrix, Analysis of continuous beams and plane trusses using system approach, Analysis of simple orthogonal rigid frames using system approach with kinematic indeterminacy.

## Module 5:
### Unit 1: Plastic Analysis:
Introduction – definitions of plastic hinge and plastic moment capacity and Assumptions – shape factors for various sections – Basic theorems for finding collapse loads – method of plastic analysis - static method and kinematic method - kinematic method applied to beams and frames.

**Text Books:**

1. "Structural Analysis" Vol –I & II by V.N.Vazirani and M.M.Ratwani, Khanna Publishers,8th addition Nov 2015.

2. "Structural Analysis" Vol I & II by G.S.Pandit and S.P.Gupta, Tata McGraw Hill Education Pvt. Ltd.6th addition Jan 2012

3. "Structural Analysis" Vol –I & II by S S Bhavikatti, Vikas Publications, 4th addition, Oct 2010

**Reference Books:**
1. "Structural Analysis" by Hibbeler, pearson Education Ltd, 9th addition Oct 2017.
2. "Structural Analysis" by by R. Vaidyanathan and P. Perumal, Naveen Publishing House. 3rd, April 2017.
3. "Basic Structural Analysis" by C S Reddy, I K International Publishing House Pvt, Ltd, July 2017

**E-Resources:**

1. https://nptel.ac.in/courses/105/105/105105109/

**Course Outcomes:**
On completion of the course, the students will be able to:
1. **Analyze** two and three hinged arches.
2. **Apply** influence line diagrams for the analysis of structures under moving load.
3. **Construct** the bending moment diagram for beams and frames using flexibility method.
4. **Analyze** the beams and indeterminate frames by system stiffness method.
5. **Describe** the method of plastic analysis for structures

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<tr><td>**CO5**</td><td>2</td><td>3</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td></tr>
<tr><td>**Average**</td><td>2.2</td><td>2.2</td><td>1.2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>0.6</td><td>1.2</td><td>-</td></tr>
</table>

**Pre-Requisites:** Engineering Geology, Hydrology and Water Resource Engineering

## Module 1:
### Unit 1: Ground Water Occurrence and Movement
Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention, storage coefficient, Transmissivity.

### Unit 2: Ground Water Movement
Permeability, Darcy's law, differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system. Ground water flow contours their applications.

## Module 2:
### Unit 1: Steady and Unsteady Ground Water Flow
Steady groundwater flow towards a well in confined and unconfined aquifers numericals– Dupuits and Theisms equations, Assumptions, Formation constants, yield of an open well, Well interface and well tests, Recuperation Test. Unsteady flow towards a well, On equilibrium equations, Thesis solution, Jacob and Chows simplifications, Leaky aquifers Well Interference.

## Module 3:
### Unit 1: Surface and Subsurface Investigation
Surface methods of exploration – Electrical resistivity and Seismic refraction methods. Subsurface methods, Geophysical logging and resistivity logging, Radioactive logging method.

### Unit 2: Artificial Recharge of Ground Water
Concept of artificial recharge – recharge methods, relative merits, Applications of GIS and remote sensing-Artificial Recharge of Ground water along with Case studies.

## Module 4:
### Unit 1: Ground Water Survey and Ground Water Quality
Geophysical survey of ground water, Surface Geophysical techniques, aerial Photogrammetry applications along with Case Studies in Subsurface Investigation. Bore log, Interpretation of Bore log Results.

### Unit 2: Ground Water Quality
Factors affecting ground water quality, water quality requirements, Ground water quality degradation, Reasons for ground water quality degradation.

## Module 5:
### Unit 1: Saline Water Intrusion in Aquifer

Occurrence of saline water intrusions, Ghyben- Herzberg relation, Shape of interface, control of seawater intrusion.

## Unit 2: Groundwater Basin Management
Concepts of conjunction use, Case studies.

**Text Books:**
1. "Ground water Hydrology" by David Keith Todd, John Wiley & Sons, 3rd edition (Jan 2004).
2. "Groundwater" by H. M. Raghunath, New Age International,15th edition (Jan 2003).

**Reference Books:**
1. "Groundwater Assessment Development & Management" by K. R. Karanth, Tata Mc Graw Hill Co. Ltd, 12th edition (Aug 2008).
2. "Applied Hydrogeology" by C. W. Fetta, CBS Publishers & Distributers, 7th edition, (Mar 2018)

**E-Resources**
1.https://nptel.ac.in/courses/105/103/105103026/
2. https://nptel.ac.in/courses/105/105/105105042/

**Course Outcomes:**
On completion of the course, the students will be able to:
1. **Assess** the importance of Ground water hydrological cycle and Ground water movement.
2. **Explain** the behavior of steady and unsteady ground water flow.
3. **Interpret** the geophysical exploration data for scientific source finding of aquifers.
4. **Assess** the quality of the ground water.
5. **Justify** the effective measures taken for controlling saline water intrusion.

<table>
<tr><td colspan="14"><strong>CO-PO/PSO Mapping Chart</strong><br><br>(3/2/1 indicates strength of correlation)<br><br>3 – Strong; 2 – Medium; 1 - Weak</td></tr>
<tr><td rowspan="2"><strong>Course Outcomes (COs)</strong></td><td colspan="11"><strong>Program Outcomes (POs)</strong></td><td colspan="2"><strong>Program Specific Outcomes*</strong></td></tr>
<tr><td>PO 1</td><td>PO 2</td><td>PO 3</td><td>PO 4</td><td>PO 5</td><td>PO 6</td><td>PO 7</td><td>PO 8</td><td>PO 9</td><td>PO 10</td><td>PO 11</td><td>PO 12</td><td>PSO 1</td><td>PSO 2</td></tr>
<tr><td><strong>CO1</strong></td><td>3</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>1</td><td>-</td></tr>
<tr><td><strong>CO2</strong></td><td>2</td><td>2</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>-</td></tr>
<tr><td><strong>CO3</strong></td><td>2</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td></tr>
<tr><td><strong>CO4</strong></td><td>2</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td></tr>
<tr><td><strong>CO5</strong></td><td>2</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td></tr>
<tr><td><strong>Average</strong></td><td>2.2</td><td>1.6</td><td>0.4</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>0.2</td><td>1.2</td><td>-</td></tr>
</table>

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | | B. Tech CE III Year-I Sem | | | |
|---|---|---|---|---|---|---|
| Course Code: **L311G** | **SUSTAINABLE MATERIALS & GREEN BUILDINGS** | | L | T | P | D |
| Credits: 3 | **(PE-I)** | | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Nil

## Module 1:

### Unit 1: Sources of Energy:

Renewable and Non-renewable sources of energy - Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources, potential of these sources, hazards, demand and supply in India, Global efforts to reduce carbon emissions. Building modelling- Energy analysis, Monitoring.

### Unit 2: Carbon emission:

Forecasting, Control of carbon emission, Air quality and its monitoring carbon footprint, Environmental issues, Minimizing carbon emission.

## Module 2:

### Unit 1: Sustainable Materials:

Sustainable Materials, Depletion of natural resources for preparation of building materials, renewable and recyclable resources, energy efficient materials, Embodied Energy of Materials. Green cement, Biodegradable materials, Smart materials, Volatile Organic Compounds (VOC's), Recycled materials.

### Unit 2: Green Building Planning and Specifications:

Environment friendly and cost-effective Building Technologies, Green Strategies for Building Systems, Alternative Construction Methods, Waste and Water management and Recycling by Sustainable Facilities, Heating, Ventilation and Air Conditioning

## Module 3:

### Unit 1: Concept of Green Buildings:

Green building - Definition, Features, Necessity, Initiatives, Green buildings in India, Green building Assessment – Green Building Rating Systems (BREEAM, USGBC, LEED, IGBC,TERI-GRIHA, GREEN STAR),Criteria for rating, Energy efficient criteria ,environmental benefits, economic benefits, health and social benefits, Major energy efficiency areas for building, 172 Contribution of buildings towards Global Warming. Life cycle cost of buildings. Certification Programs (including GEM and ECBC Certification) Energy audit procedures -energy simulation tools.

## Module 4:

### Unit 1: Design of Green Buildings:

Sustainable sites, Impact of construction on environment, Life cycle assessment, Principles of sustainable development in Building Design, Design on Bioclimatic and solar passive architecture,

Considerations of energy consumption, water use, and system reliability, indoor air quality, noise level, comfort, cost efficiency in building design

## Module 5:
### Unit 1: Construction of Green Buildings:
Energy efficient construction, Practices for thermal efficiency and natural lighting. Eco-friendly water proofing; Energy conservation building codes building rating, Maintenance of green buildings, Cost and Performance Comparisons and Benchmarking, Green Project Management Methods, Cost/benefit analysis of green buildings, Life-cycle analysis of green buildings.

### Text Books:

1. ''Alternative Building Materials and Technologies'' By K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao, New Age International Publishers.
2. ''Integrated Life Cycle Design of Structures' 'By AskoSarja , SPONPress.
3. ''Non-conventional Energy Resources'' By D S Chauhan and S K Sreevasthava, New Age International Publishers.
4. ''Green Buildings (McGraw hill publication)'' by Gevorkian.


### Reference Books:
1. ''Emerald Architecture: case studies in green buildings'', The Magazine of Sustainable Design
2. ''Understanding Green Building Guidelines'',For Students and Young Professionals, Traci Rose Rider, W. W. Norton & Company Publisher.
3. ''Understanding Green Building Materials''by Traci Rose Rider, W. W. Norton & Company Publisher

### E-Resources
1. https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-ce08
2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ce40

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

1. Explain the underlying principles, history, environmental and economic impacts of green building technology and to identify the criteria for rating systems along with the established Indian codes and guidelines.
2. Identify various Renewable and Non-renewable sources of energy along with their carbon footprints and comprehend the techniques and benefits of building performance testing such as building modelling and energy analysis, monitoring and metering.
3. Identify the energy efficient green building materials and explain the cost effective Building Technologies, Strategies for Green Building Systems and Energy Conservation Measures.
4. Explain the application of design guidelines of Green Building considering the Energy Conservation Measures.
5. Discuss the building codes, relevant legislation governing the consumption of resources and emission of environmental pollutants by buildings and be familiar with IGBC green building certification procedure.

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 3 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 | - |
| CO2 | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - | 2 | - |
| CO3 | 2 | 1 | - | - | - | - | - | - | - | - | - | - | 1 | - |
| CO4 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 1 | - |
| CO5 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 1 | - |
| Average | 2.2 | 1.6 | 0.4 | - | - | - | - | - | - | - | - | 0.2 | 1.2 | - |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 - Weak**

**Pre-Requisites:** Geo technical Engineering

## LIST OF EXPERIMENTS

**EXPERIMENT 1:** Liquid Limit Test.
**EXPERIMENT 2:** Plastic Limit test.
**EXPERIMENT 3:** Field density by core cutter method.
**EXPERIMENT 4:** Field density by sand replacement method.
**EXPERIMENT 5:** Grain size distribution by sieve analysis.
**EXPERIMENT 6:** Determination of specific gravity by pycnometer.
**EXPERIMENT 7:** Permeability of soil by constant and variable head test methods.
**EXPERIMENT 8:** Standard Proctor's Compaction Test.
**EXPERIMENT 9:** California Bearing Ratio Test (CBR Test).
**EXPERIMENT 10:** Unconfined compression test.
**EXPERIMENT 11:** Direct shear test.
**EXPERIMENT 12:** Differential free swell index (DFSI) test.

**Note:** At least any **Ten (10)** experiments have to be conducted out of available **Twelve (12)** experiments.

**Course outcomes:** The student will be able to:
1. Demonstrate site specific field investigations including collection of soil Samples for testing and observation of behavior/building damage.
2. Perform identify and classify soils based on standard geotechnical engineering practice.
3. Perform laboratory compaction and in-place density tests for fill quality control.
4. Evaluate unsoaked and soaked California Bearing Ratio (CBR) tests used to estimate subgrade behavior during construction and beneath permanent structures.
5. Determine engineering properties of soils.

## CO-PO/PSO Mapping Chart

### (3/2/1 indicates strength of correlation)

### 3 – Strong; 2 – Medium; 1 - Weak

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 2 | - | - | 3 | - | 1 | - | - | - | - | - | 2 | 1 | - |
| CO2 | 2 | - | - | 3 | - | 1 | - | - | - | - | - | 2 | 2 | - |
| CO3 | 1 | 1 | - | 2 | - | 1 | - | - | - | - | - | 1 | 1 | - |
| CO4 | 2 | 2 | - | 2 | - | 1 | - | - | - | - | - | 1 | 1 | - |
| CO5 | 2 | 2 | - | - | - | 1 | - | - | - | - | - | 1 | 1 | - |
| Average | 1.8 | 1 | | 2 | | 1 | | | | | | 1.4 | 1.2 | |

**Pre-requisite:** Engineering Chemistry**.**

**LIST OF EXPERIMENTS**
**EXPERIMENT 1:** Determination of pH.
**EXPERIMENT 2:** Determination of Electrical Conductivity and Turbidity.
**EXPERIMENT 3:** Determination of Total Solids (Organic and inorganic).
**EXPERIMENT 4:** Determination of Acidity.
**EXPERIMENT 5:** Determination of Alkalinity.
**EXPERIMENT 6:** Determination of Hardness (Total, Calcium and Magnesium Hardness).
**EXPERIMENT 7:** Determination of Chlorides content.
**EXPERIMENT 8:** Determination of Optimum Coagulant Dosage by JAR Test.
**EXPERIMENT 9:** Determination of Dissolved Oxygen (Winkler Method).
**EXPERIMENT 10:** Determination of Chemical Oxygen Demand& Biological Oxygen Demand.
**EXPERIMENT 11:** Determination of Residual Chlorine.
**EXPERIMENT 12:** Determination of Noise level measurement.

**Note:** At least any **Eight (10)** experiments have to be conducted out of available **Twelve (12)** experiments.

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

1. **Describe** the equipment used to conduct the test procedures.

2. **Identify** the various water standards through the experiments conducted in the lab.

3. **Examine** and estimate water, wastewater quality.

4. **Compare** the water quality with prescribed standards set by the local governments.

5. **Develop** a report on the quality aspect of the environment.

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | - | 2 | - | 2 | 3 | 2 | 2 | 1 | - | - | - | - | 2 | 1 |
| CO2 | - | 2 | - | 2 | 2 | 2 | 1 | 1 | - | - | - | - | 1 | 2 |
| CO3 | - | 1 | - | 2 | 3 | 2 | 2 | 1 | - | - | - | - | 1 | 1 |
| CO4 | - | 2 | - | 2 | 3 | 2 | 2 | 1 | - | - | - | - | 1 | 1 |
| CO5 | - | 2 | - | 1 | 3 | 2 | 2 | 1 | - | - | - | - | 2 | 2 |
| Average | - | 1.8 | - | 1.8 | 2.8 | 2 | 1.8 | 1 | - | - | - | - | 1.4 | 1.4 |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 - Weak**

| AY: 2022-23 Onwards | **J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY** (UGC Autonomous) | | **B. Tech III Year- I Semester** | | | |
|---|---|---|---|---|---|---|
| Course Code: **L31M1** | **ARTIFICIAL INTELLIGENCE** | | L | T | P | D |
| Credits: 0 | | | **2** | **0** | **0** | **0** |

**Pre-Requisites:**
1. Mathematics, Probability and statistics
2. Knowledge in programming Language

**Course Objectives:**

The students should be able to

1. Know the AI based problems.
2. Illustrate AI techniques for representing the basic problem.
3. Illustrate Advanced AI techniques to solve the problem.
4. Define Learning and explain various learning techniques.
5. Understand the usage expert system

## Module 1:

**Introduction:** AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents.

**Basic Search Strategies**: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

## Module 2:

**Advanced Search**: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning.

**Basic Knowledge Representation and Reasoning**: Propositional Logic, First Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem.

## Module 3:

**Advanced Knowledge Representation and Reasoning**: Knowledge Representation Issues, Non- monotonic Reasoning, and Other Knowledge Representation Schemes.

**Reasoning Under Uncertainty**: Basic probability, acting under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks.

## Module 4:

**Learning:** What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

## Module 5:

**Expert Systems:** Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

**Text Books**

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, ThirdEdition, Prentice- Hall, 2010

**Reference Books**

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, TheMcGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for ComplexProblem Solving, Pearson Education, 6th ed., 2009.

**E-Resources**

1. https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_pdf_ver sion.htm
2. https://www.alljntuworld.in/download/artificial-intelligence-ai-materials-notes/
3. https://drive.google.com/file/d/1mPiI4jy6YkJRDiCT21xgzN0VDNkrW23X/View
4. https://nptel.ac.in/courses/106/105/106105077/

**Course Outcomes**

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

**CO1**. Identify the AI based problems.
**CO2.** Apply AI techniques for representing the basic problem.
**CO3**. Apply Advanced AI techniques to solve the problem.
**CO4**. Analyse Learning and explain various learning techniques.
**CO5**. Illustrate the use of expert system

**CO-PO/PSO Mapping**

| Course Outcomes | Program Outcomes(POs)/Program Specific Outcomes(PSOs) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 | 3 | - | | - | - | - | - | - | - | - | - | 3 | - |
| **CO2** | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 | 3 |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | - | - | - | 3 | - |
| **CO4** | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 | - |
| **CO5** | 3 | 3 | - | - | - | - | - | - | - | - | - | - | 3 | 3 |
| **Average** | 3.0 | 3.0 | 3.0 | 2.2 | - | - | - | - | - | - | - | - | 3.0 | 3.0 |

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

**Pre-Requisites:**

## Module 1: SOFT SKILLS

Introduction - What are Soft Skills? - Importance of Soft Skills - Marketing Your Soft Skills - Negotiating - Exhibiting Your Soft Skills - Identifying Your Soft Skills - Improving Your Soft Skills - Top 60 Soft Skills.

Know Thyself/ Self – Discovery - Process of Knowing Yourself - SWOT Analysis.

## Module 2: CAREER PLANNING

Introduction - Benefits of Career Planning - Guidelines for choosing a career - Myths about choosing a career goal - Final thoughts on career planning - Things one should know while starting career and during his/her career.

## Module 3: ART OF SPEAKING

Introduction - What Makes Communication Important? - Defining Communication - Process of Communication - Channels of Communication - Formal and Informal Communication Network - Barriers to Communication - Tips for Effective Communication - Art of Public Speaking.

## Module 4: ART OF WRITING

Introduction - Importance of Writing - Creative Writing - Writing Tips - Drawbacks of Written Communication - Letter Writing and Resume Writing.

## Module 5: ETIQUETTES AND MANNERS

Introduction - Modern Etiquettes - Benefits of Etiquettes - Classification of Etiquettes.

Introduction - Practicing Good Manners - Manners at the Wheel - Professional Manners - Social Skills (Manners) - Getting Along with People - Corporate Grooming Tips.

**Text Books**

1. Dr. Alex. K. Soft Skills: *Know yourself and Know the World*. S. Chand & Company Pvt. Ltd: New Delhi: 2014.

**Reference Books**

1**.** Ashraf Rizvi. M. *Effective Technical Communication*. McGraw-Hill: New Delhi: 2010
2**.** K. R. Lakshminarayanan, *Speak in English,* Scitech Publications, Chennai, 2009.

**E-Resources**

- https://en.wikipedia.org/wiki/Soft_skills

- https://www.mbaskool.com/business-concepts/human-resources-hr-terms/1779-career-development.html

**Course Outcomes**

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

**CO1**. Learn the importance of soft skills and knowing thyself.

**CO2**. Understand how to build their (students) career.

**CO3**. Communicate effectively by applying appropriate speaking techniques.

**CO4**. Write letters and resumes effectively by applying appropriate writing techniques.

**CO5**. Learn the good manners and social etiquettes.

**CO-PO/PSO Mapping**

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

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

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | **B. Tech CE** **III Year-II Sem** | | | |
|---|---|---|---|---|---|
| Course Code: **L321A** | **TRANSPORTATION ENGINEERING** | L | T | P | D |
| **Credits: 4** | | **3** | **1** | **0** | **0** |

**Pre-Requisites: NIL**

## Module 1: Highway Development and Planning

**Unit-I:**

Highway development in India – Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

## Module 2: Highway Geometric Design

**Unit-I:**

Importance of Geometric Design- Design controls and Criteria- Highway Cross Section Elements- Sight Distance Elements- Stopping Sight Distance, Overtaking Sight Distance and intermediate Sight Distance- Design of Horizontal Alignment- Design of Super elevation and Extra widening- Design of Transition Curves Design of Vertical Alignment Gradients- Vertical curves.

## Module 3: Traffic Engineering

**Unit-I:**

Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies- Data Collection and Presentation-speed studies- Data Collection and Presentation- Parking Studies and Parking characteristics- Road Accidents-Causes and Preventive measures- Accident Data Recording – Traffic regulation and management: Road Traffic Signs – Types and Specifications – Road Markings-Need for Road Markings-Types of Road Markings- Design of Traffic Signals –Webster Method –IRC Method.

## Module 4: Intersection Design

**Unit-I:**

Types of Intersections – Conflicts at Intersections- Types of At-Grade Intersections- Channelization: Objectives –Traffic Islands and Design Criteria-Types of Grade Separated Intersections- Rotary Intersection – Concept of Rotary and Design Criteria- Advantages and Disadvantages of Rotary Intersection. Introduction to Intelligent. Transport System.

## Module 5: Railway and Airport Engineering

**Unit-I: Introduction to Railway Engineering**

Component parts of railway track-ballast-sleepers-rails- Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Crossings and Turnouts.

## Unit II: Introduction to Airport Engineering

Airport layout - Factors affecting Selection of site for Airport – Aircraft Characteristics-Geometric Design of Runway- Computation of Runway length – Correction for runway length – Orientation of Runway – Wind Rose Diagram. Taxiway and Exit Taxiway Design.

## Text Books

1. Highway Engineering" by S.K.Khanna, C.E.G.Justo& A Veeraragavan , Nem Chand & Bros., 10th edition June 2017.
2. "A Textbook of Transportation Engineering" by S.P. Chandola – S.Chand& Co. Ltd. (January 2016).

## Reference Books

1. 'Principles of Transportation Engineering'' by ParthaChakroborty&Aminesh Das; Prentice Hall of India, 2nd edition (October 2017).
2. "Transport planning and Traffic Engineering" by Dr. L. R. Kadiyali, Khanna Publications 9th Edition (2017).
3. "Airport Planning and Design"- S.K. Khanna and Arora,Nemchand Bros,10th Edition (2017).

## E Resources

1. https://nptel.ac.in/courses/105/101/105101087/

## Course Outcomes

At the end of the course, the student will be able to:
1. Explain the Factors affecting Highway Alignment.
2. Design geometric elements of a highway network.
3. Analyse the Traffic Volume and Speed.
4. To Perform the signal studies and design.
5. Understand the Basic concepts of railway engineering and Airport engineering.

<table>
<tr><td colspan="16" align="center"><strong>CO-PO/PSO Mapping Chart</strong><br><br>(3/2/1 indicates strength of correlation)<br><br>3 – Strong; 2 – Medium; 1 - Weak</td></tr>
<tr><td rowspan="2"><strong>Course Outcomes (COs)</strong></td><td colspan="12"><strong>Program Outcomes (POs)</strong></td><td colspan="2"><strong>Program Specific Outcomes*</strong></td></tr>
<tr><td>PO 1</td><td>PO 2</td><td>PO 3</td><td>PO 4</td><td>PO 5</td><td>PO 6</td><td>PO 7</td><td>PO 8</td><td>PO 9</td><td>PO 10</td><td>PO 11</td><td>PO 12</td><td>PSO 1</td><td>PSO 2</td></tr>
<tr><td><strong>CO1</strong></td><td>2</td><td>1</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td></tr>
<tr><td><strong>CO2</strong></td><td>2</td><td>3</td><td>3</td><td>-</td><td>-</td><td>3</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>3</td><td>3</td></tr>
<tr><td><strong>CO3</strong></td><td>2</td><td>2</td><td>3</td><td>-</td><td>-</td><td>3</td><td>1</td><td>-</td><td>-</td><td>2</td><td>-</td><td>2</td><td>2</td><td>1</td></tr>
</table>

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO4** | 2 | 2 | 3 | - | - | 2 | - | - | - | - | - | 2 | 2 | 2 |
| **CO5** | 2 | 2 | 3 | - | - | 2 | - | - | - | - | - | 2 | 3 | 3 |
| **Average** | 2 | 2 | 2.8 | - | - | 2 | 0.6 | - | - | 0.4 | - | 1.2 | 2.2 | 2.2 |

**Pre-Requisites:** Geotechnical Engineering, Applied Mechanics

## Module 1:
### Unit 1: Soil Exploration
Need, methods of soil exploration, boring and sampling methods, penetration tests, Geophysical methods, planning of soil exploration program and preparation of soil investigation report.

## Module 2:
### Unit 1: Slope Stability
Infinite and finite earth slopes, types of failures, factor of safety of infinite slopes stability analysis by Swedish slip circle method, method of slices, Bishop's Simplified method of slices, Taylor's Stability Number, stability of slopes of earth dams under different conditions.

## Module 3:
### Unit 1: Earth Pressure Theories
Rankine's theory of earth pressure, Active and passive earth pressure of cohesionless soil, Active and passive earth pressure of cohesive soil Coulomb's earth pressure theory, Comparison of Coulomb's Theory with Rankine's Theory, Culmann's graphical method.
### Unit 2: Retaining Walls
Types of retaining walls, stability consideration for cantilever retaining walls against overturning, sliding, and bearing capacity.

## Module 4:
### Unit 1: Pile Foundation
Classification of piles, Uses of piles, Pile driving, Load carrying capacity of piles based on static pile formulae, Dynamic pile formulae, Pile Capacity through static analysis and penetration tests, Group action of piles ,Pile group efficiency, Settlement of pile and pile groups, Negative skin friction.

## Module 5:
### Unit 1: Bearing Capacity
Bearing Capacity of Foundation: Bearing capacity – Basic Definitions, Factors affecting bearing capacity, Estimation of Bearing capacity by different methods, Analytical measures – Terzaghi's and Meyerhof methods and calculations, Field measures – SPT, CPT and Plate load tests.
### Unit 2: Soil Stabilization

Introduction to stabilization, Mechanical stabilization, lime, cement, bitumen, chemical etc. Grouting: Injection and principles, grouting pressure criteria, grouting equipment, injection chemicals.

**Text Books:**
1. "Basic and Applied Soil Mechanics" by Gopal Ranjan & ASR Rao, New Age International Publishers, 3rd edition (Jan 2016).
2. "Soil Mechanics and Foundation Engineering" by V.N.S. Murthy, CBS Publishers, and Distributors, 10th edition (Jan 2018).

**Reference Books:**
1. "Analysis and Design of Substructures'', Swami Saran, Oxford and IBH Publishing company Pvt Ltd (1998).
2. "Geotechnical Engineering" by Manoj Dutta & Gulati S. K, Tata McGraw-Hill Publishers,3rd edition (Jan 2011).

**E resources**
1. https://nptel.ac.in/courses/105/105/105105176/
2. https://nptel.ac.in/courses/105/107/105107120/

**Course Outcomes:**

On completion of the course, the students will be able to:
1. Evaluate soil investigation for any civil engineering construction.
2. Analyze the different failures due to slope and its control methods.
3. Analyze earth retaining structures for any kind of soil medium.
4. Estimate pile and pile group capacity for any kind of soil including group efficiency and negative skin friction.
5. Identify the different waste naturally or artificial materials available to enhance the strength properties of the soil.

<table>
<tr><td colspan="14" align="center"><strong>CO-PO/PSO Mapping Chart</strong><br><br>(3/2/1 indicates strength of correlation)<br><br>3 – Strong; 2 – Medium; 1 - Weak</td></tr>
<tr><td rowspan="2"><strong>Course Outcomes (COs)</strong></td><td colspan="12"><strong>Program Outcomes (POs)</strong></td><td colspan="2"><strong>Program Specific Outcomes*</strong></td></tr>
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<tr><td><strong>CO1</strong></td><td>3</td><td>2</td><td>-</td><td>2</td><td>-</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>1</td><td>-</td></tr>
<tr><td><strong>CO2</strong></td><td>2</td><td>3</td><td>1</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>-</td></tr>
<tr><td><strong>CO3</strong></td><td>2</td><td>1</td><td>2</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>1</td><td>-</td></tr>
</table>

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO4** | 1 | 2 | - | 3 | - | 1 | - | - | - | - | - | 2 | 1 | - |
| **CO5** | 1 | 1 | - | 2 | - | 1 | - | - | - | - | - | 2 | 1 | - |
| **Average** | 1.8 | 1.8 | 1.5 | 2.33 | | 1 | | | | | | 1.4 | 1.2 | |

**Pre-requisite:** Environmental Engineering

## Module 1:

### Unit-1: Introduction to Industrial Waste:

Sources of Industrial Waste, Characteristics of the Industrial Wastes, Inorganic salts, Acids and Alkalis, Organic matter, Suspended solids, Floating Solids and liquids, Heated Water, Colour, Toxic chemicals, Microorganisms, Inplant survey– composite sampling – Tolerance limits for effluents discharges into inland surface water's public sewers, and on land for irrigation – standards.

## Module 2:

### Unit 1: Waste Reduction:

Waste Reduction Alternatives, Volume Reduction, Classification of Wastes, Conservation Of wastewater, Changing Production to Decrease Wastes, Re-Using Both Industrial and Municipal Effluents for Raw Water supplies, Elimination of Batch or Slug Discharge of Process Wastes, In general.

## Module 3:

### Unit 1: Wastewater Treatment:

Waste minimization - Equalization - Neutralization – Oil separation – Flotation –Precipitation, Heavy metal Removal – adsorption – Aerobic and anaerobic biological Treatment – Sequencing batch reactors – High Rate reactors. Advanced Treatment Methods: Nitrification and De-nitrification, Phosphorous removal – Heavy metal removal, Membrane Separation Process, Air Stripping and Absorption Processes.

## Module 4:

### Unit 1: Special Treatment Methods:

Special Treatment Methods Chemical oxidation, Ozonation, Photocatalysis, Wet Air Oxidation, Evaporation, Ion Exchange, Membrane Technologies, Nutrient removal Disposal of Treated Waste.

## Module 5:

### Unit 1: Disposal Process:

Comparison of Disposal Methods, Tanning Process, Sources of wastewater and their characteristics, Effects of waste on receiving water and sewers, Treatment of Cotton and Woolen Textile Mill Waste.

### Unit 2: Common Effluent Treatment Plants (CETPs):

Location, Need, General Design considerations and principles, Operation & Maintenance Problems, Zero effluent discharge systems, Wastewater reuse, Waste Audit.

**Text Books:**
1. "Wastewater Treatment" by M. N. Rao and A. K. Datta, Oxford I. B. H publishers.
2. "Handbook of Industrial Waste Disposal" by Richard A. Conway Richard Ross, Van Nostrand publisher (1980).
3. "Industrial Waste Treatment" Contemporary Practice and Vision for the Future by Nelson Leonard Nemerow, Nemerow , Butterworth Weinemann publisher (2006).

**Reference Books:**
1. "Zero Pollution for Industry: Waste Minimization through Industrial Complexes" by N. L. Nemerow, John Wiley & Sons, 1995.
2. "Wastewater Treatment for Pollution Control" by S. J. Arceivala, Tata Mc. Graw Hill, 1999.
3. "Industrial Water Pollution Control" by W. W. Eckenfelder, Mc. Graw Hill.
4. Indian standards: IS: 2490 (1963), IS: 3306 (1065).
5.

**E-Resources**
1. https://nptel.ac.in/courses/105/106/105106119/

**Course Outcomes:**
On completion of the course, the students will be able to:
1. **Assess** the quality of domestic and industrial water requirements.
2. **Apply** the different procedure involved in efficient industrial effluent management with reference to specific industries.
3. **Describe** the Principles of pollution prevention and mechanism of oxidation processes.
4. **Apply** the suitable technologies for the treatment of wastewater.
5. **Prioritize** the various disposal methods for efficient operation and maintenance of treatment plants.

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| **CO1** | - | 3 | - | - | - | 2 | 1 | - | - | - | - | - | 2 | 1 |
| **CO2** | - | - | 3 | 2 | - | - | - | - | - | - | - | - | 1 | 2 |
| **CO3** | 3 | 2 | - | - | - | - | 2 | - | - | - | - | - | 2 | 2 |
| **CO4** | - | - | 3 | 2 | 3 | - | - | - | - | - | - | - | 2 | 2 |
| **CO5** | - | - | 3 | 2 | - | 1 | 2 | - | - | - | - | - | 2 | 2 |
| **Average** | 0.6 | 1 | 1.8 | 1.2 | 0.6 | 0.6 | 1 | - | - | - | - | - | 1.8 | 1.8 |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 - Weak**

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | | B. Tech CE III Year-II Sem | | | |
|---|---|---|---|---|---|---|
| Course Code: **L321F** | **REMOTE SENSING AND GIS (PE - II)** | | L | T | P | D |
| Credits: 3 | | | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Surveying

## Module 1:

### Unit-1: Introduction to Photogrammetry

Principle and types of aerial photographs, stereoscopy, Map Vs Mosaic, ground control, Parallax measurements for height and determinations.

## Module 2:

### Unit 1: Remote Sensing – I

Basic concepts and foundation of remote sensing. Elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units.

### Unit 2: Remote Sensing – II

Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

## Module 3:

### Unit 1: Geographic Information System

Geographic Information System and terminologies. GIS categories, components of GIS, fundamental operations of GIS and theoretical framework for GIS.

### Unit 2: Types of data representation

Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer based GIS, Feature based GIS mapping.

## Module 4:

### Unit 1: GIS Spatial Analysis

Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

## Module 5:

### Unit 1: Water Resources Applications-I

Land use/Land cover in water resources, Surface water mapping and inventory. Rainfall – Runoff relations and runoff potential indices of watersheds. Flood and Drought impact assessment and monitoring. Watershed management for sustainable development and Watershed characteristics.

### Unit 2: Water Resources Applications-II

Reservoir sedimentation, Fluvial Geomorphology, water resources management and monitoring, Ground Water Targeting and Identification of sites for artificial Recharge structures, Drainage

Morphometry, Inland water quality survey and management. Water depth estimation by bathymetry.

**NOTE:** The above topics have to be explained in the laboratory through demonstration and execution

**Text Books:**
1. "Remote Sensing and its applications" by LRA Narayana University Press, 4th Edition Jan 2012.
2. "Principals of Geo physical Information Systems" – Peter.A.Burragh and Rachael A. Mc Donnell, Oxford Publishers, 2$^{nd}$ Edition Oct 2004.

**Reference Books:**
1. "Concepts & Techniques of GIS" by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications. 3$^{rd}$ Edition Jan 2010.
2. "Remote Sensing and Geographical Information systems" by M.Anji Reddy JNTU Hyderabad, B.S.Publications. 2$^{nd}$ Edition Apr 2008.

**E-Resources**
1. http://nptel.ac.in/courses/105107155/
2. http://www.nptelvideos.in/search?q=remote+sensing+%26+gis
3. ebooks.library.cornell.edu/k/kmoddl/pdf/016_002.pdf

**Course Outcomes:**
On completion of the course, the students will be able to:
1. **Describe** the different approaches of photogrammetric to analyze the ground condition.
2. **Apply** the concepts of remote sensing on earth surface features and atmosphere.
3. **Examine** the GIS data collection and input output overview.
4. **Analyze** the different geo spatial data.
5. **Describe** the different water resource application using RS and GIS.

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 3 | 3 | - | - | - | 2 | 1 | - | - | - | - | 2 | 2 | 2 |
| CO2 | - | - | 3 | 3 | - | - | - | 1 | - | - | - | 2 | 2 | 2 |
| CO3 | - | 2 | 3 | 1 | 2 | - | - | - | - | - | - | 2 | 2 | 2 |
| CO4 | - | 2 | 3 | 3 | 1 | - | - | 2 | - | - | - | 2 | 2 | 2 |
| CO5 | 2 | 2 | 3 | - | - | - | - | 1 | - | - | - | 2 | 2 | 2 |
| Average | 1 | 1.8 | 2.4 | 1.4 | 0.6 | 0.4 | 0.2 | 0.8 | - | - | - | 2 | 2 | 2 |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 - Weak**

**Pre-Requisites:** Concrete Technology.

## Module 1:

### Unit 1: Introduction to Structural Health Monitoring

Definition of structural health monitoring (SHM) - Motivation for SHM - SHM as a way of making materials and structures smart - SHM and biomimetic - Process and pre- usage monitoring as a part of SHM - SHM as a part of system management - Passive and active SHM-NDE - SHM and NDECS - Variety and multidisciplinary - The most remarkable characters of SHM Birth of the SHM community.

## Module 2:

### Unit 1: Application of SHM in Civil Engineering

Introduction to capacitive methods, capacitive probe for cover concrete, SHM of a bridge, applications for external post tensioned cables, monitoring historical buildings.

## Module 3:

### Unit 1: Condition Survey and NDE of Concrete Structure

Definition and objective of Condition survey, stages of condition survey (Preliminary, Planning, Inspection and Testing stages), possible defects in concrete structures, quality control of concrete structures - Definition and need, Quality control applications in concrete structures, NDT as an option.

## Module 4:

### Unit 1: Non-Destructive Testing of Concrete Structures

Introduction to NDT - Situations and contexts, where NDT is needed, classification of NDT procedures, visual Inspection, half-Cell electrical potential methods, Schmidt Rebound Hammer Test, resistivity measurement, electromagnetic methods, radiographic Testing, ultrasonic testing, Infra-Red thermography, ground penetrating radar, radio isotope gauges, other methods.

## Module 5:

### Unit 1: Repair Rehabilitation & Retrofitting of Structures

Damage assessment of concrete structures, Materials and methods for repairs and rehabilitation, modelling of repaired composite structure, structural analysis, and design
Importance of re-analysis, execution of rehabilitation strategy, Case studies.

**Text Books:**
1. "Structural Health Monitoring" by Daniel Balageas, Claus-Peter Fritzen and Alfredo Guemes John Wiley-ISTE, London, 6th edition Oct 2015.

2. "Health Monitoring of Structural Materials and Components - Methods with Applications", by Douglas E Adams, John Wiley & Sons, New York, 3th edition Jan 2017.

**Reference Books:**
1. "Structural Health Monitoring and Intelligent Infrastructure" Vol.-1 by J.P. Ou, H. Li and Z. D. Duan, Taylor & Francis, London, 2nd edition, Apr 2005.
2. "Structural Health Monitoring with Wafer Active Sensors" by Victor Giurglutiu, Academic Press Inc, 3rd edition Nov 2015.

**E-Resources**
1. https://nptel.ac.in/courses/112/104/112104160/
2. https://nptel.ac.in/courses/105/106/105106202/

**Course Outcomes:**

On completion of the course, the students will be able to:
1. **Explain** the fundamentals of structural health monitoring.
2. **Describe** the applications in civil engineering.
3. **Explain** the quality control applications in concrete structures.
4. **Estimate** the quality and strength of concrete structures.
5. **Decide** the appropriate repair, strengthening, rehabilitation and retrofitting technique required for a case study building.

## CO-PO/PSO Mapping Chart

### (3/2/1 indicates strength of correlation)

### 3 – Strong; 2 – Medium; 1 - Weak

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 1 | 1 | 2 | - | - | 2 | 2 | - | - | - | - | 1 | 1 | - |
| CO2 | 2 | - | 2 | - | - | 3 | 1 | - | - | - | - | 2 | 2 | - |
| CO3 | 2 | - | - | 3 | 2 | 1 | - | - | - | - | - | 2 | 1 | - |
| CO4 | 2 | 1 | - | 2 | 3 | - | - | - | - | - | - | 2 | 1 | - |
| CO5 | 2 | 1 | - | - | - | 2 | 3 | - | - | - | - | - | 1 | - |
| Average | 1. | 0.6 | 0.8 | 1 | 1 | 1.6 | 1.2 | | | | | 1.4 | 1.2 | |

**Pre-requisite:** Concrete technology, Estimation and costing.

## Module 1:
### Unit-1: Estimation:
Types of estimates-Methods of estimates, approximate methods of Estimating, Principles of working out quantities for detailed and abstract estimates, centre line method, long wall short wall method- General items of work.

## Module 2:
### Unit-1: Detailed Estimates of Buildings:
Detailed Estimates of Buildings – Abstract of Quantities –Reinforcement- bar bending schedules. Specifications-Rate Analysis-SSR – Working out data for various items of work- over- head and contingent charges.

## Module 3:
### Unit-1: Earthwork for roads and canals:
Estimating the quantities of earthwork for roads and canals.

## Module 4:
### Unit-1: Contracts:
Types of contracts -including BOT, BOOT EPC, PPC– contract Documents – Conditions of contract, contract procedures, Tendering process, Rights, and responsibilities of parties to contracts. Contract act- selection of contractor.

## Module 5:
### Unit-1: Valuation of buildings &Industrial establishments:
Purpose and principles of valuation, Depreciation, methods of calculating depreciation, methods of valuation, Rental method, development method, profit based method.

**Text Books:**
1. "Construction Technology" by Subira K. Sarkar, Subhajit Saraswathi / Oxford University Press, 3rd edition, Apr 2009.
2. "Construction Equipment and Management" by S C Sharma, New age International publisher,2nd edition, Jan 2018

**Reference Books:**
1. "Construction Planning, Equipment and Methods" by Peurifacy, Schexnayder, Shapira TMH, 3rd edition, oct 2010.
2. "Project Planning and Control with PERT and CPM" by B.C. Punmia, K.K. Khandelwala –

Laxmi Publication,4<sup>th</sup> edition Nov 2015.

**E-Resources**

1. https://www.researchgate.net/publication/227991740
2. https://nptel.ac.in/courses/105/103/105103093/

**Course Outcomes:**

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

1. **Explain** different activities involves in construction.
2. **Describe** the quality and quantity control different machinery used for the construction.
3. **Examine** risks and uncertainty related issues in constructions.
4. **Differentiate** the type of estimation and contracts.
5. **Construct** the various types CPM and PERT networks.

<table>
<tr><td colspan="15" align="center"><strong>CO-PO/PSO Mapping Chart</strong><br><br>(3/2/1 indicates strength of correlation)<br><br>3 – Strong; 2 – Medium; 1 – Weak</td></tr>
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<tr><td><strong>CO1</strong></td><td>3</td><td>1</td><td>1</td><td>-</td><td>2</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>3</td><td>1</td><td>3</td><td>-</td></tr>
<tr><td><strong>CO2</strong></td><td>3</td><td>1</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td><td>3</td><td>-</td><td>2</td><td>-</td></tr>
<tr><td><strong>CO3</strong></td><td>3</td><td>1</td><td>-</td><td>-</td><td>1</td><td>1</td><td>1</td><td>-</td><td>-</td><td>-</td><td>3</td><td>-</td><td>2</td><td>-</td></tr>
<tr><td><strong>CO4</strong></td><td>2</td><td>2</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>3</td><td>1</td><td>2</td><td>-</td></tr>
<tr><td><strong>CO5</strong></td><td>3</td><td>2</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>3</td><td>2</td><td>3</td><td>2</td></tr>
<tr><td><strong>Average</strong></td><td>2.8</td><td>1.4</td><td>0.8</td><td>-</td><td>0.8</td><td>1</td><td>1</td><td>-</td><td>-</td><td>-</td><td>3</td><td>0.8</td><td>2.4</td><td>0.4</td></tr>
</table>

**Pre-Requisites:** Structural Analysis.

## Module 1:

### Unit-I:Introduction

Concepts of FEM – Steps involved – merits & demerits – energy principles – Discretization – Rayleigh –Ritz method of functional approximation. Principles of Elasticity: Equilibrium equations – strain displacement relationships in matrix form – Constitutive relationships for plane stress, plane strain and Axi-symmetric bodies of revolution with Axi-symmetric loading.

## Module 2:

### Unit-I: One Dimensional Bar element

Displacement function &Shape functions for one dimensional element – Stiffness matrix for linear and quadratic bar element - one dimensional bar problem – temperature loading -solution of bars with varying C/s using FE formulation.

### Unit 2: One Dimensional  Beam element

FE formulation of beam element- shape functions -Stiffness matrix for beam element- load vector – analysis of continuous beam using FE formulation.

## Module 3:

### Unit 1: Plane truss

Bar element in 2-D assembly -solution of a Plane truss problem- Transformation matrix

### Unit 2:  Two-Dimensional FEM:

Different types of elements for plane stress and plane strain analysis – Displacement models – CST element, LST element- generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system – area and volume coordinates.

## Module 4:

### Unit 1:Concepts of ISO parametric elements

Generation of element stiffness and nodal load matrices for 3-node triangular element and four node rectangular elements. Isoparametric formulation: Concepts of isoparametric elements for 2D analysis- 4 –noded and 8-noded iso-parametric quadrilateral elements – Simple problems with CST and LST elements.

## Module 5:

### Unit-1: Axi-symmetric analysis:

Basic Principles -Formulation of 3-node Iso-parametric plane strain element, Asymmetric ring element.

**Unit-2: Solution techniques:**

Numerical Integration, Lagrangian and Serendipity elements. Static condensation, assembly of elements and solution techniques for static loads.

**Text Books**

1. "Finite Elements Methods in Engineering" by Tirupati.R. Chandrupatla and Ashok D. Belegundu ,4$^{th}$ Edition, Pearson Education Publications.
2. "Finite element analysis" by S.S. Bhavikatti, 3$^{rd}$ Edition New age international publishers (1 January 2015).

**Reference Books**

1. "Concepts and Applications of Finite Element Analysis" by Robert D.Cook, David S. Malkus and Michael E.Plesha. Jhon Wiley & Sons 4$^{th}$ Edition (1 January 2007).
2. "Finite Element analysis – Theory & Programming" by C.S.Krishna Moorthy,2$^{nd}$ Edition Tata Mc.Graw Hill Publishers,2007.
3. "Finite element analysis" by P.Seshu, Prentice Hall of India.  (1 January 2003)

**E-Resources**
   1. https://nptel.ac.in/courses/105/106/105106051/

**Course Outcomes**

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

1. **Develop** constitutive relations in mechanics and formulate equilibrium equations in elasticity

**2. Formulate** structural mechanics problems by using energy principles and applying Rayleigh - Ritz method.

3. **Solve** simple structural mechanics problems of one dimension using Numerical technique of Finite element method.

4. **Develop** finite element formulation of two-dimensional problems and solve them for displacements at nodes.

5. **Assemble** Stiffness matrices, apply boundary conditions and solve for the displacements in Axi symmetric problem.

## CO-PO/PSO Mapping Chart (Draft)

### (3/2/1 indicates strength of correlation)

### 3 – Strong; 2 – Medium; 1 - Weak

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 2 | 2 | - | - | 1 | - | - | - | - | - | - | 1 | - | 1 |
| CO2 | 2 | 3 | - | - | 2 | - | - | - | - | - | - | 1 | - | 1 |
| CO3 | 2 | 3 | - | - | 2 | - | - | - | - | - | - | - | - | 1 |
| CO4 | 2 | 3 | 1 | - | 2 | - | - | - | - | - | - | - | - | 1 |
| CO5 | 2 | 3 | 2 | - | 2 | - | - | - | - | - | - | - | - | 1 |
| Average | 2 | 2.8 | 0.6 | - | 1.8 | - | - | - | - | - | - | 0.4 | - | 1 |

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | | **B. Tech CE** **III Year-II Sem** | | | |
|---|---|---|---|---|---|---|
| Course Code: **L321J** | **CONSTRUCTION TECHNOLOGY AND PROJECT MANAGEMENT** **(PE - III)** | | L | T | P | D |
| Credits: 3 | | | **3** | **0** | **0** | **0** |

**Pre-requisite:** Concrete technology, Estimation and costing

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**Module 1:**

**UNIT-1: Fundamentals of Construction Technology**

Construction Activities – Process – Construction Schedule –Construction Records – Documents - Codes and Regulations., and scheduling of Material and Equipment.

**Module 2:**

**Unit-1: Construction Method**

Earthwork, excavators, rollers, dozers, Scrapers – Handling Equipment – Draglines and Clamshells -Concrete Equipment – Hauling Equipment – Cranes – Piling – Concrete and Concreting – Form work – Fabrication and Erection.

**Module 3:**

**Unit-1: Quality Control**

Quality Control, Assurance and Safety – ISO – 9000 Quality Systems.

**Unit-2: Safety**

Principles on Safety – Personnel, Fire and-Electrical Safety – Environment Protection– Concept of Green Building. Air condition and HVAC systems.

**Module 4:**

**Unit-1: Contract Management**

Project Estimation – Types of Estimation – Contract Document – Classification – Bidding – Procurement Process. Construction Claims, Dispute and Project Closure – Source of Claim – Claim Management – Dispute Resolution –Arbitration – Construction Closure – Contract Closure – Documentation.

**Module 5:**

**Unit-1: Construction Planning:** Project Planning Techniques – Planning of manpower, Equipment Economics and Finance. Project – PERT – CPM, Resources.

**Text Books:**

**1.** "Construction Technology" by Subira K. Sarkar, Subhajit Saraswathi / Oxford University Press, 3rd edition, Apr 2009.

**2.** "Construction Equipment and Management" by S C Sharma, New age International publisher,2nd edition, Jan 2018.

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3. "Construction Planning, Equipment and Methods" by Peurifacy, Schexnayder, Shapira TMH, 3rd edition, oct 2010.
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**Course Outcomes:**
On completion of the course, the students will be able to:
6. **Explain** different activities involves in construction.
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| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| **CO1** | 2 | 2 | 2 | - | - | - | - | - | - | - | 3 | 2 | 1 | - |
| **CO2** | 2 | - | 2 | - | 3 | - | - | - | - | - | - | 2 | 2 | - |
| **CO3** | 2 | 1 | - | - | - | 3 | 2 | 2 | - | - | - | 2 | 1 | - |
| **CO4** | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 | 1 | - |
| **CO5** | 2 | 2 | - | - | - | 1 | - | 1 | - | - | 3 | 2 | 1 | - |
| **Average** | 2 | 1.4 | 0.8 | - | 0.6 | 0.8 | 0.4 | 0.6 | | 0.4 | 1.6 | 2 | 1.2 | |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 - Weak**

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | B. Tech CE III Year-II Sem | | | |
|---|---|---|---|---|---|
| Course Code: **L3211** | **TRANSPORTATION ENGINEERING LAB** | L | T | P | D |
| Credits: 1 | | **0** | **0** | **2** | **0** |

**Pre-Requisites:** Transportation Engineering

**LIST OF EXPERIMENTS:**

**I TESTS ON ROAD AGGREGATES:**

**EXPERIMENT 1:** Aggregate Crushing Value Test.

**EXPERIMENT 2:** Aggregate Impact Test.

**EXPERIMENT 3:** Specific Gravity and water absorption Test.

**EXPERIMENT 4:** Los Angeles Abrasion Value Test.

**EXPERIMENT 5:** Flakiness and Elongation Indices of Coarse Aggregates.

**II TESTS ON BITUMINOUS MATERIALS:**

**EXPERIMENT 6:** Penetration Test.

**EXPERIMENT 7:** Ductility Test.

**EXPERIMENT 8:** Softening Point Test.

**EXPERIMENT 9:** Marshal stability Test.

**III TRAFFIC STUDIES:**

**EXPERIMENT 10:** Traffic volume study at Mid blocks.

**EXPERIMENT 11:** Traffic volume study at Junctions.

**EXPERIMENT 12:** Spot Speed Studies.

**Note:** At least any **Ten (10)** experiments have to be conducted out of available **Twelve (12)** experiments.

**Course Outcomes**
At the end of the course, the student will be able to:
1. Understand the mechanical Properties of Highway Materials.
2. Perform the Tests on Road Aggregates and Bituminous Material.
3. Explain Engineering Properties of Aggregate and Bitumen.
4. Analyze Traffic Volume for a Given Location on the Road.
5. Analyze the Design Speed, Maximum Speed & Minimum Speed of traffic.

| CO-PO/PSO Mapping Chart | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **(3/2/1 indicates strength of correlation)** | | | | | | | | | | | | | |
| **3 – Strong; 2 – Medium; 1 - Weak** | | | | | | | | | | | | | |
| **Course Outcomes (COs)** | **Program Outcomes (POs)** | | | | | | | | | | | | **Program Specific Outcomes\*** |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| **CO1** | - | - | 3 | - | - | - | - | 3 | 3 | - | 3 | 3 | - | - |
| **CO2** | - | - | 2 | - | - | - | - | 3 | 3 | - | 3 | 3 | - | - |
| **CO3** | - | - | 2 | - | - | - | - | 3 | 2 | - | 3 | 2 | - | - |
| **CO4** | - | - | 2 | - | - | - | - | 2 | 2 | - | 3 | 2 | - | - |
| **CO5** | - | - | 2 | - | - | - | - | 2 | 2 | - | 2 | 1 | - | - |
| **Average** | | | 2.2 | | | | | 2.6 | 2.4 | | 2.8 | 2.2 | | |

**Pre-Requisites:**

## Module 1: COMMUNICATION SKILLS

Introduction- Channel of communication, Process of communication, Language as a tool of communication, levels of communication, the flow of communication, communication networks, Barriers to Communication; Body language – Eye contact, facial expressions, gestures, posture, and body movements.

## Module 2: PRESENTATION SKILLS

Nature and Importance of Oral Presentation; Planning the Presentation-Define the Purpose, Analyze the Audience, Analyze the Occasion and Choose a suitable title; Preparing the Presentation-Develop the Central Idea, Develop the Main Ideas, Gather Supporting Material and Plan Visual Aids; Organizing the Presentation-Introduction, Body, Conclusion; Rehearsing the Presentation; Improving Delivery and Choosing Delivery Methods; Handling the Stage Fright.

## Module 3: GROUP DISSCUSSIONS

Nature of GD- What is a GD? GD and Debate, Importance of GD skills; Characteristics of successful GDs- Subject knowledge, Oral Communication skills, Leadership skills, Team Management; GD Strategies- Getting the GD Started, Contributing Systematically, Creating a Friendly Cooperative Atmosphere, Moving the Discussion along, Promoting Optimal Participation, Handling Conflict and Effecting Closure; Techniques for Individual Contribution- Topic Analysis, Discussing Problems, Discussing Case Studies; Group Interaction Strategies-Exchanging Opinions, Exchanging Suggestions and Proposals.

## Module 4: INTERVIEW SKILLS

The Interview process; Characteristics of the Interview- Planning, Purpose, Conversation, Two-way Interaction and Informality; Pre-interview Preparation Techniques-Self-analysis, Research the Organization, Job Analysis, Revise your Subject Knowledge, Develop the Interview File; Interview Questions- Types of Interview Questions, Answering Strategies; FAQs and Practice; Projecting a positive image; Alternative Interview formats.

## Module 5: PROFESSIONAL WRITING SKILLS

Resumes -Resume Design, Parts of Resume, Resume style; Job Applications-opening, body, and closing; E-mail writing-Format, Standard E-mail practices and E-mail writing strategies; Report writing-nature and significance, types of reports, formats of reports; Proposals- types of Proposals, structure of Formal Proposals, parts of a formal Proposals; Technical Articles-types of Technical

Articles, Journal articles and Research papers-Review and Research Articles, Elements of Technical Articles and Writing Strategies.

## Reference Books

1. Ashraf Rizvi. M. *Effective Technical Communication*. McGraw-Hill: New Delhi: 2010
2. K. R. Lakshminarayanan, *Speak in English,* Scitech Publications, Chennai, 2009. Print.
3. Dr. Alex. K. Soft Skills: *Know yourself and Know the World*. S. Chand & Company Pvt. Ltd: New Delhi: 2014. Print.
4. Raman Meenakshi and Sangeeta Sharma. *Technical Communication: Principles and Practice.* Oxford University Press: New Delhi: 2007.Print.

## E-Resources

https://www.skillsyouneed.com/ips/communication-skills.html
https://www.skillsyouneed.com/presentation-skills.html
https://www.coursera.org/articles/presentation-skills
https://www.javatpoint.com/group-discussion
https://hbr.org/1964/01/strategies-of-effective-interviewing
https://en.wikipedia.org/wiki/Professional_writing

## Course Outcomes

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

**CO1**. Learn the importance of communication skills.

**CO2**. Understand how to give the presentation.

**CO3**. Participate in GDs by applying appropriate speaking techniques.

**CO4**. Know the required skills to face interviews.

**CO5**. Write letters and resumes effectively by applying appropriate writing techniques.

### CO-PO/PSO Mapping

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

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

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | **B. Tech CIVIL** **IV Year-I Sem** | | | |
|---|---|---|---|---|---|
| Course Code: **L32M2** | **CYBER SECURITY** | L | T | P | D |
| Credits: **2** | | **2** | **0** | **0** | **0** |

1. To familiarize various types of cyber-attacks andcyber-crimes
2. To give an overview of the cyberlaws
3. To study the defensive techniques against theseattacks

**UNIT - I**

**Introduction to Cyber Security:** Basic Cyber Security Concepts, layers of security, Vulnerability, threat,Harmfulacts,InternetGovernance—ChallengesandConstraints,ComputerCriminals,CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

**UNIT - II**

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

**UNIT - III**

**Cybercrime: Mobile and Wireless Devices:** Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security ChallengesPosedbyMobileDevices,RegistrySettingsforMobileDevices,Authenticationservice Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, OrganizationalMeasuresforHandlingMobile,OrganizationalSecurity PoliciesandMeasuresinMobile Computing Era,Laptops.

**UNIT- IV**

**Cyber Security: Organizational Implications:** Introduction, cost of cybercrimes and IPR issues, web

threatsfororganizations,securityandprivacyimplications,socialmediamarketing:securityrisksand perilsfororganizations,socialcomputingandtheassociatedchallengesfororganizations.

**CybercrimeandCyberterrorism:**Introduction,intellectualpropertyinthecyberspace,theethical dimensionofcybercrimesthepsychology,mindsetandskillsofhackersandothercybercriminals.


## UNIT - V

PrivacyIssues:BasicDataPrivacyConcepts:FundamentalConcepts,      DataPrivacyAttacks,Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial,etc.

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.
**Mini-Cases:** The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

### TEXT BOOKS:
1. Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives,Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm,Applications,andPerspectives,CRCPress,ISBN9780815371335,2018

### REFERENCES:
1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

**Web Resources:**

1.

**Course Outcomes:**

The students will be able to understand cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | **B. Tech CIVIL** **IV Year-I Sem** | | | |
|---|---|---|---|---|---|
| Course Code: **L32T2** | **FOUNDATIONS OF ENTREPRENEURSHIP** | L | T | P | D |
| Credits: **2** | | **2** | **0** | **0** | **0** |

**Pre-Requisites:**

## MODULE:

### UNIT - 1:
**Understanding Entrepreneurial Mindset**- The revolution impact of entrepreneurship- The evolution of entrepreneurship - Functions of Entrepreneurs – types of entrepreneurs –
### UNIT - 2:
Approaches to entrepreneurship- Process approach- Role of entrepreneurship in economic development- Twenty first century trends in entrepreneurship.

## MODULE:II

### UNIT:1
**The Individual Entrepreneurial Mind-Set and Personality**- The entrepreneurial journey-Stress and the entrepreneur - the entrepreneurial ego - Entrepreneurial motivations-
### UNIT:2
Motivational cycle – Entrepreneurial motivational behavior – Entrepreneurial competencies.
Corporate Entrepreneurial Mindset, the nature of corporate entrepreneur- conceptualization of corporate entrepreneurship Strategy-sustaining corporate entrepreneurship.

## MODULE: III
### UNIT - 1:
**Launching Entrepreneurial Ventures** - opportunities identification- Finding gaps in the market place – techniques for generating ideas- entrepreneurial Imagination and Creativity- the nature of the creativity process - Innovation and entrepreneurship.
### UNIT -2:
Methods to initiate Ventures- Creating new ventures-Acquiring an Established entrepreneurial venture- Franchising- advantage and disadvantages of Franchising.

## MODUL IV:
### UNIT - 1:
**Legal Challenges of Entrepreneurship** - Intellectual property protection - Patents, Copyrights - Trademarks and Trade secrets - Avoiding trademark pitfallsFeasibility Analysis - Industry and competitor analysis - Formulation of the entrepreneurial Plan-

### UNIT - 2:

The challenges of new venture start-ups, developing an effective business model – Sources of finance - Critical factors for new venture development - The Evaluation process.

**MODULE:V**
**UNIT - 1:**
**Strategic Perspectives in Entrepreneurship** - Strategic planning - Strategic actions-strategic positioning- Business stabilization - Building the adaptive firms .

**UNIT - 2:**
Understanding the growth stage – Internal growth strategies and external growth strategies, Unique managerial concern of growing ventures. Initiatives by the Government of India to promote entrepreneurship, Social and women entrepreneurship -T-hub, J-hub.

**Text Books**

3. S. S.Khanka, Entrepreneurship Development, S. Chand Publications, 2015. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
4. Rajeev Roy, Entrepreneurship, 2e, Oxford publications, 2012

**Reference Books**

- D F Kuratko and T V Rao, Entrepreneurship- A South-Asian Perspective, Cengage Learning, 2012.
- Bruce R. Barringer/ R. Duane Ireland, Entrepreneurship Successfully launching new ventures, 4e, Pearson, 2015
- Nandan .H, Fundamentals of Entrepreneurship, PHI, 2013
- Madhurima Lal Shikha Sahai – Entrepreneurship, Excel Books.

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | B. Tech CIVIL IV Year-I Sem | | | |
|---|---|---|---|---|---|
| Course Code: **L411A** | **Energy Science & Engineering** | L | T | P | D |
| Credits: **3** | | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Nil

## Module 1:
**Unit-I:**

Introduction to Energy Science: Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment

## Module 2:
**Unit I**:

Energy Sources: Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)

## Module 3:
**Unit I:**

Energy & Environment: Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy.

## Module 4:
**Unit-I:**

Civil Engineering Projects connected with the Energy Sources: Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings, design and construction constraints and testing procedures for reactor containment buildings; Spent Nuclear fuel storage and disposal systems

## Module 5:
**Unit-I:**

Engineering for Energy conservation: Concept of Green Building and Green Architecture;Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated); LEED ratings; Identification of

energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption

**Text Books**
1. Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press
2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press
3. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaiam
4. Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII,

**Reference Books**
1. Ristinen, Robert A. Kraushaar, Jack J. AKraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley
2. UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment
3. E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company 8. Related papers published in international journals

**E resources:**
**Course Outcomes:**
On completion of the course, the students will be able
1. List and generally explain the main sources of energy and their primary applications nationally and internationally
2. Have basic understanding of the energy sources and scientific concepts/principles behind them
3. Understand effect of using these sources on the environment and climate
4. Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.
5. List and describe the primary renewable energy resources and technologies.

| 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 | 3 | - | - | - | - | 2 | 1 |
| CO2 | - | 3 | 3 | - | - | - | 2 | 1 | - | - | - | - | 2 | 1 |
| CO3 | - | - | - | - | - | 2 | 3 | 2 | - | - | - | - | 1 | 1 |
| CO4 | - | - | 2 | - | - | 2 | 3 | 2 | - | - | - | - | 2 | 2 |
| CO5 | - | - | - | - | - | 3 | 2 | 1 | - | - | - | - | 2 | 2 |
| Average | - | 0.6 | O.6 | - | - | 1.8 | 1.2 | 1.8 | - | - | - | - | 1.8 | 1.4 |

**Pre-Requisites:** Strength of Materials, Structural Analysis, SE-I

## Module 1:

### Unit 1: Structural Steel:

Materials-Manufacturing of iron and steel-type of structural steel-mechanical properties of steel-concepts of plasticity-yield strength-load and combinations-local buckling behaviour of steel-concepts of limit state design-different limit states serviceability stability check.

## Module 2:

### Unit 1: Concentric Connections:

Bolted connections-IS:800-2007 Specifications-Design strength-efficiency of joint prying action-welded connections-type of welded joints specifications-design requirements

### Unit -2: Eccentric Connections:

Design of beam end connections – framed and seated type- welded and bolted connections- design of bracket connections- Eccentric connections.

## Module 3:

### Unit 1: Design of tension & compression members:

Design of tension members-Design Strength-Design procedure-splice-lug angles Design of compression members-buckling-slenderness ratio-Load carrying capacity laced columns battened columns-splice-column base slab base-Gusseted base.

## Module 4:

### Unit 1: Design of beams:

Design of beams-plastic moment-bending and shear strength/buckling-design of laterally supported beams –welded sections and built-up beams – Beam web and flange splices.

## Module 5:

### Unit 1: Industrial buildings

Structural elements –Design of crane girder and gantry girders.

### Unit 2: Steel Roof Trusses:

Types of roof trusses-Sizes, alignment, and dimensions of roof truss-loading on roof trusses-wind load calculations -purlin design-Analysis of Roof Trusses using graphical method-Design of connections.

**Text Books**

1. ''Limit State design of Steel Structures'' by S.K.Duggal, McGraw Hill Education,3rd Edition(1 July 2017).
2. ''Design of steel Structure'' by N.Subramanian, Oxford University Press(1 January 2018)

**Reference Book:**

1. ''Design of Steel Structures'' by S.S.BhaviKatti(By limit state methos), IK International Publishing House Pvt.Limited ,2nd Edition (28 july 2012).
2. IS.800:2007-Indian Code Practice for Construction in Steel.

**E-Resources**
1. https://nptel.ac.in/courses/105/105/105105162/

**Course Outcomes**

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

1. Examine the limit states and design principles in design of steel structural members as per IS Code.
2. Apply the different loads and load combination that come on steel structural elements and roof trusses.
3. Evaluate the design strength of tension, compression members and beams.
4. Analyze and design steel bolted and welded connections.
5. Design tension member, compression member, beam, simple and built-up sections.

<table>
<tr><td colspan="16"><b>CO-PO/PSO Mapping Chart</b><br><br>(3/2/1 indicates strength of correlation)<br><br>3 – Strong; 2 – Medium; 1 - Weak</td></tr>
<tr><td rowspan="2"><b>Course Outcomes (COs)</b></td><td colspan="12"><b>Program Outcomes (POs)</b></td><td colspan="2"><b>Program Specific Outcomes*</b></td></tr>
<tr><td><b>PO 1</b></td><td><b>PO 2</b></td><td><b>PO 3</b></td><td><b>PO 4</b></td><td><b>PO 5</b></td><td><b>PO 6</b></td><td><b>PO 7</b></td><td><b>PO 8</b></td><td><b>PO 9</b></td><td><b>PO 10</b></td><td><b>PO 11</b></td><td><b>PO 12</b></td><td><b>PSO 1</b></td><td><b>PSO 2</b></td></tr>
<tr><td><b>CO1</b></td><td>3</td><td>2</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td></tr>
<tr><td><b>CO2</b></td><td>2</td><td>2</td><td>2</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td></tr>
<tr><td><b>CO3</b></td><td>2</td><td>-</td><td>3</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td></tr>
<tr><td><b>CO4</b></td><td>2</td><td>-</td><td>3</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td></tr>
<tr><td><b>CO5</b></td><td>2</td><td>2</td><td>3</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td></tr>
<tr><td><b>Average</b></td><td>2.2</td><td>1.4</td><td>2.2</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td></tr>
</table>

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | B. Tech CE IV Year-I Sem | | | |
|---|---|---|---|---|---|
| Course Code: **L411C** | **HYDROLOGY AND WATER RESOURCE ENGINEERING** | L | T | P | D |
| Credits: 3 | | **3** | **0** | **0** | **0** |

**Pre-requisite:** Fluid Mechanics

**Module 1:**

**Unit-1: Introduction to Engineering hydrology and its applications:**
Hydrologic cycle, types and forms of precipitation, rainfall measurements, types of rain gauges, computation of average rainfall over a basin, Processing of rainfall data, adjustment of record, rainfall double mass curve. Run off factors affecting run off over a catchment, empirical and rational formula.

**Unit-2: Abstraction from rainfall:** Evaporation, factors affecting evaporation, measurement of evaporation, evapotranspiration, consumptive use, Penman and Balney and criddle methods – Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

**Module 2:**

**Unit-1:** Distribution of runoff: Hydrograph analysis flood hydrograph- effective rainfall- baseflow separation-direct runoff-unit hydrograph, definitions, and limitations of application of unit hydrograph, derivation of unit hydrograph from direct runoff hydrograph and vice versa S-hydrograph, synthetic unit hydrograph. Peak flow determination, empirical formula for flood discharge, flood frequency studies, flood discharge by rational formula, flood routing.

**Module 3:**

**Unit-1:** Ground Water Occurrence: Types of aquifiers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, Darcys law, radial flow to wells in unconfined and unconfined aquifiers, types of wells, well constructionwell development.

**Module 4:**

**Unit-1:** Introduction: Sources of Water, Population Forecast, Design Period, Water Demand, Fire Demand. Water Quality, Characteristics and Testing, Drinking Water Standards. Water Borne Diseases.

**Unit-2:** Water treatment units: Sedimentation, Coagulation, Flocculation – Principles and Design. Filtration – Theory, Working and Design of Slow, Rapid Gravity and Multi-Media Filters, Troubles in Operation Comparison of Filters. Disinfection and Miscellaneous Treatment Methods

**Module 5:**

**Unit 1:** Reservoirs and Pipelines: Service Reservoirs, Joints and Valves. Fire Hydrants, Water Meters, Laying and Testing of Pipelines and Pump House.

**Text Books-**
1. "Irrigation and waterpower engineering" by Dr.B.CPunmia, Dr. Pande B Lal 16th edition, laxmi publications pvt ltd, 2009.

2. *"Water Supply & Sanitary Engineering"* By J.S. Birdie, G.S. Birdie, Dhanpat Raj Publications 2018 9th edition.

**Reference Books:**
1. ''Environmental Engineering- I'' (Water Supply Engineering) by Dr. B.CPunmia, Er.Ashokkumar Jain, Dr Arun.K.Jain,laxmi publications pvt ltd, 2016.
2. "Irrigation water resources and water power engineering" by Dr.PN Modi Standard book house Publications 2019 , 11th edition.

**Web Resources:**
1. https://nptel.ac.in/courses/105/106/105106119/
2. https://nptel.ac.in/courses/105/104/105104103/

**Course Outcomes:**

On completion of the course, the students will be able to:
1. **Compute** average rainfall over a basin and understand recording and non-recording type rain gauges and to determine infiltration indices and runoff from a basin.
2. **Construct** the unit hydrograph and determine the peak flood discharge.
3. **Determine** the aquifer parameters and their discharge from wells.
4. **Select** the most appropriate technique for the treatment of water.
5. **Design** the components of the distribution systems.

<table>
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<tr><td><b>CO3</b></td><td>3</td><td>-</td><td>-</td><td>-</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td></td><td>3</td><td>-</td></tr>
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<tr><td><b>CO5</b></td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td><b>Average</b></td><td>2</td><td>1</td><td>2</td><td>-</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>3</td><td>-</td><td>-</td><td>3</td><td>-</td></tr>
</table>

**Pre-requisite:** Structural Engineering –I(RCC)

## Module 1:
### Unit 1: Introduction:

Historic development – General principles of prestressing Pretensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their characteristics. I.S.Code provisions, Methods and Systems of Prestressing; Pretensioning and post tensioning methods – Analysis of post tensioning - Different systems of prestressing like Hoyer System, Magnel System Freyssinet system and Gifford – Udall System.

## Module 2:
### Unit 1:Losses of prestress:

Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.

Analysis of sections for flexure; Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.

## Module 3:
### Unit 1:Design of sections for flexure and shear:

Allowable stress, Design criteria as per I.S. Code – Elastic design of simple rectangular and I-section for flexure, shear, and principal stresses – design for shear in beams – Kern – lines, cable profile-PT slabs.

### Unit 2:Analysis of end blocks:

Types of end blocks and Importance of end block, Analysis and design of end block by Guyon method and IS method -Approximate design of End block-for not more thantwo cables- Anchorage zone stresses- Anchorage zone reinforcement – Transfer of prestress in pretensioned members

## Module 4:
### Unit 1:Deflections:

Necessity of deflection estimation, limitations of deflections. Deflections of pre- stressed concrete beams with uniformly distributed and point loads.

## Module 5:
### Unit 1:Composite section:

Introduction – Analysis of stress – Differential shrinkage – General designs considerations – Shear connectors.

**Text Books:**
1. '"Prestressed Concrete" by Krishna Raju, 6th Edition Tata McGraw Hill Education (28 April 2018).
2. "Prestressed Concrete" by N. Rajagopalan, 2nd Edition, Narosa publications.

**Reference Books:**
1. "Prestressed Concrete" by Ramamrutham, 5th Edition, Dhanpatrai Publications(2013).
2. "Design of Prestressed concrete structures (Third Edition)" by T.Y. Lin & Ned H.Burns. (7 September 2010).
3. Codes: BIS code on prestressed concrete, IS 1343-2012 by John Wiley & Sons.

**E-Resources**
1. https://nptel.ac.in/courses/105/106/105106118/

**Course Outcomes:**

On completion of the course, the students will be able to:
1. **Apply** the concept of prestressing and determine the losses of prestress.
2. **Analyze** the prestressed concrete beam and suggest the cable profile for beam.
3. **Evaluate** the prestressed concrete beam for flexure and shear.
4. **Apply** skills to satisfy the serviceability and strength provisions of the Indian Standards (IS: 1343-2012).
5. **Examine** the principles of design of composite sections and their advantages

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| **CO1** | 3 | 2 | 2 | - | - | 2 | - | - | - | - | - | 1 | 1 | - |
| **CO2** | 2 | 2 | 3 | - | - | 1 | - | - | - | - | - | 1 | 1 | - |
| **CO3** | 2 | 2 | 3 | - | - | 1 | - | - | - | - | - | 1 | 1 | - |
| **CO4** | 2 | 3 | 2 | - | - | 1 | - | - | - | - | - | 1 | 1 | - |
| **CO5** | 2 | 3 | 2 | - | - | 1 | - | - | - | - | - | 1 | 1 | - |
| **Average** | 2.2 | 2.4 | 2.4 | - | - | 1.2 | - | - | - | - | - | 1 | 1 | - |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 - Weak**

**Pre-requisite:** Transportation Engineering

## Module 1:
### Unit -1 Introduction to Pavement Design:
Variables considered in Pavement Design-Types of Pavements-Functions of individual Layers-Factors affecting Pavement Design-wheel Loads-Tire Pressure-Contact Pressure-Equivalent standard axle load (EAL) and Equivalent single wheel load (ESWL) Concepts-Traffic Analysis-Collection and Presentation Traffic Volume.

## Module 2:
### Unit - 1 Stresses in Flexible Pavement:
Stresses in Flexible Pavements-Layered Systems Concept-One-layer system-Boussinesq's two-layer system-Burmister's theory of Pavement design.

### Unit - 2 Stresses in Rigid Pavement:
Stresses in Rigid Pavements-Relative stiffness of slab-modulus of Sub Grade Reaction-stresses due to warping-stresses due to loads-stresses due to friction.

## Module 3:
### Unit - 1 Material Characteristics:
Aggregate properties and their Importance-Tests on Aggregates- Bitumen Properties-Tests on Bitumen-requirements of bituminous mix - Design-Marshall method of mix design.

## Module 4:
### Unit - 1 Flexible Pavement Design:
Flexible Pavement Design concepts, Flexible Pavement design methods- CBR method, IRC method and American association of state highway and transportation officials (AASHTO) method.

### Unit - 2 Rigid Pavement Design:
Rigid Pavement design concepts-IRC method of Rigid Pavement Design-Importance of Joints in rigid Pavements-Types of joints - Design of tie bars and dowel bars.

## Module 5:
### Unit - 1 Highway Construction:
Construction: Construction of Bituminous Pavements construction of Cement Concrete Roads-Soil Stabilization-use of Geosynthetics.
### Unit - 2 Highway Maintenance:

Highway maintenance –Pavement failures-failures in flexible Pavements-Rigid Pavement Failures-Pavement Evaluation-Benkelman Beam method. Latest Technologies in Pavement Design.

**Text Books:**
1. "Highway Engineering" by S.K.Khanna, C.E.G.Justo& A Veeraragavan , Nem Chand & Bros., 10<sup>th</sup> edition (June 2017).
2. "Principles & Practices of Highway Engineering" by Dr L.R.Kadiyali&Dr.N.B Lal, Khanna Publishers. 7<sup>th</sup> Edition (January 2019).
3. "Pavement Design" by R Srinivasa Kumar, Orient Blackswan Private Limited, (January 2013).

**Reference Books:**
1. "Principles of Pavement design" by E J Yoder.&Witzorac Mathew, John Wiley & Sons Inc. 2<sup>nd</sup> edition (January1991).
2. Pavement Analysis and Design by Yang H. Huang, Prentice Hall Inc, 2<sup>nd</sup> edition (2008).
3. IRC: 37 "Guidelines for the Design of Flexible Pavements" (Fourth Revision- 2018).
4. IRC: 58 "Guidelines for the Design of Plain Jointed Rigid Pavements for Highways" (Fourth Revision- 2015).

**E-Resources**
1. https://nptel.ac.in/courses/105/101/105101087/

**Course Outcomes:**
On completion of the course, the students will be able to:
1. **Explain** the factors considered in pavement design.
2. **Analyze** stresses induced in flexible and rigid pavements.\
3. **Describe** the properties of aggregate, bitumen, and bituminous mixes.\
4. **Design** flexible and rigid pavement by various methods.
5. **Explain** the construction of pavements and their maintenance.

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<tr><td>**CO2**</td><td>3</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
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</table>

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO4** | 3 | 3 | 3 | - | - | 2 | 1 | - | - | - | - | - | 3 | 2 |
| **CO5** | 1 | 1 | 2 | 2 | - | 2 | 1 | - | - | - | - | - | 2 | 2 |
| **Average** | 2 | 1.6 | 1.4 | 0.8 | - | 0.8 | 0.4 | - | - | - | - | - | 1.2 | 1 |

**Pre-Requisites:** Geotechnical Engineering

## Module 1:

### Unit-1: Introduction to Ground Improvement Techniques

Soil profile Need and Objectives of ground improvement, Classification of Ground Modification Techniques, factors affecting ground improvement.

### Unit-2: Dewatering

Methods of dewatering sumps- single and multi-stage well point system-vacuum well points-horizontal wells- foundation drains-blanket drains- pit area for selection of fill materials around drains-electro osmosis method.

## Module 2:

### Unit-1: Compaction

In-Situ densification methods in granular soils, vibration at the ground surface, impact at the ground surface, vibration at depth, impact at the depth. In-Situ densification methods in cohesive soils, preloading or dewatering, vertical drains, sand drains, sand wick geo drains, store and lime columns, thermal methods.

## Module 3:

### Unit-1: Stabilization

Methods of stabilization-mechanical-cement-lime-bituminous-chemical stabilization with calcium chloride, sodium silicate and gypsum.

**Unit-2: Reinforced Earth** Principles, components of reinforced earth, factors governing design of reinforced earth walls, design principles of reinforced earth walls.

## Module 4:

### Unit-1: Grouting:

Objectives of grouting, grouts and their properties, grouting methods, ascending, descending and stage grouting, hydraulic fracturing in soils.

### Unit-2: Ground Anchors and Soil Nailing:

Types of ground anchors and their suitability, Uplift capacity of anchors; Soil nailing and Applications. Soil Confinement Systems: Concept of confinement, Gabion walls, Crib walls, Sand bags, Evergreen systems and fabric form work.

## Module 5:

### Unit-1: Geo synthetics

Geo textiles, types, functions and applications, geo grids and geo membranes, functions, and applications compression test and field Vane shear test, Test under different drainage conditions.

**Unit-2: Expansive soils**

Problems of expansive soils, tests for identification, and methods of determination of swell pressure. Improvement of expansive soils, foundation techniques in expansive soils, under reamed piles.

**Text Books**

1"Finite Elements Methods in Engineering" by Tirupati.R. Chandrupatla and Ashok D. Belegundu ,4th Edition, Pearson Education Publications.

2"Finite element analysis" by S.S. Bhavikatti, 3rd Edition New age international publishers (1 January 2015).

**Reference Books**

1"Concepts and Applications of Finite Element Analysis" by Robert D.Cook, David S. Malkus and Michael E.Plesha. Jhon Wiley & Sons 4th Edition (1 January 2007).

2"Finite Element analysis – Theory & Programming" by C.S.Krishna Moorthy,2nd Edition Tata Mc.Graw Hill Publishers,2007.

3"Finite element analysis" by P.Seshu, Prentice Hall of India.  (1 January 2003)

**E-Resources**

1. https://nptel.ac.in/courses/105/108/105108075/
2.  https://nptel.ac.in/courses/105/106/105106144/

**Course Outcomes**

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

1. Apply different approaches for ground improvement.
2. Compare the different grouting method to improve the characteristics of the ground.
3. Apply different methods of in situ compaction methods to increase the strength characteristics of the soil.
4.  List the various stabilization techniques by using locally available material
5.  Identify the different soil stabilization techniques with the aid of Geosynthetics.

## CO-PO/PSO Mapping Chart (Draft)

### (3/2/1 indicates strength of correlation)

### 3 – Strong; 2 – Medium; 1 - Weak

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 2 | 2 | - | - | 1 | - | - | - | - | - | - | 1 | - | 1 |
| CO2 | 2 | 3 | - | - | 2 | - | - | - | - | - | - | 1 | - | 1 |
| CO3 | 2 | 3 | - | - | 2 | - | - | - | - | - | - | - | - | 1 |
| CO4 | 2 | 3 | 1 | - | 2 | - | - | - | - | - | - | - | - | 1 |
| CO5 | 2 | 3 | 2 | - | 2 | - | - | - | - | - | - | - | - | 1 |
| Average | 2 | 2.8 | 0.6 | - | 1.8 | - | - | - | - | - | - | 0.4 | - | 1 |

**Pre-Requisites:**

**Module 1:**

### Unit-I: Basics and Microstructure

Materials, Atomic Bonding, Structure of Solids, Movement of Atoms, Development of Microstructure

**Module 2:**

### Unit-I: Material Behaviour

Surface Properties, Response to Stress, Failure Theories, Fracture Mechanics, Rheology & Thermal properties

**Module 3:**

### Unit-I: Structural Materials - 1

Review of Construction Materials & Criteria for Selection, Wood and Wood Products, Polymers, Fibre Reinforced Polymers, Metals

**Module 4:**

### Unit-I: Structural Materials - 2

Bituminous Materials, Concrete, Glass

**Module 5:**

### Unit-I: Non-Structural Materials, Accessories and Finishes

Waterproofing Materials, Polymer Floor Finishes, Anchors

**Text Books:**
5. "Building Materials, P.C. Varghese, Prentice-Hall India, 2555.

**Reference Books:**
1. Materials Science and Engineering: An introduction, W.D. Callister, John Wiley, 1994.
6. Materials Science and Engineering, V. Raghavan, Prentice Hall, 1990.
7. Properties of Engineering Materials, R.A. Higgins, Industrial Press, 1994.
8. Construction materials: Their nature and behaviour, Eds. J.M. Illston and P.L.J. Domone, 3rd ed., Spon Press, 2551.
9. The Science and Technology of Civil Engineering Materials, J.F. Young, S. Mindess, R.J. Gray & A. Bentur, Prentice Hall, 1998.
10. Engineering Materials 1: An introduction to their properties & applications, M.F. Ashby and D.R.H. Jones, Butterworth Heinemann, 2553.

11. The Science and Design of Engineering Materials, J.P. Schaffer, A. Saxena, S.D. Antolovich, T.H. Sanders and S.B. Warner, Irwin, 1995.
12. Concrete: Microstructure, properties and materials, P.K. Mehta and P.J.M. Monteiro, McGraw Hill, 2556.
**13.** Properties of concrete, A.M. Neville, Pearson, 2554**.**

**E-Resources**

1. https://nptel.ac.in/courses/105106053

**Course Outcomes:**

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

1. Understand Micro structure of materials.
2. Explain various failure theories and thermal properties of materials.
3. Explain properties of wood products and metals
4. Understand basic properties of concrete, bitumen and glass
5. List out properties of water proofing materials and polymer floor finishes

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<tr><td>**CO4**</td><td>2</td><td>1</td><td>-</td><td>1</td><td>-</td><td>-</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>**CO5**</td><td>2</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>**Average**</td><td>2.2</td><td>1.3</td><td>-</td><td>1</td><td>-</td><td>1</td><td>1.5</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1.5</td></tr>
</table>

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| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | B. Tech CE IV Year-I Sem | | | |
|---|---|---|---|---|---|
| Course Code: **L411I** | **POLLUTANTS AND WATER SUPPLY** **Professional Elective Course – V** | L | T | P | D |
| Credits: 3 | **(MANDATORY MOOC)** | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Air Pollution

**Module 1:**

**Unit-I: Pollutants and Types of Pollutions**

Pollutants and their Effects, Air Pollution, Land Pollution, Water Pollution

**Module 2:**

**Unit-I: Quality and Collection**

Water Quality-Criteria & Analysis, Water Requirements, Sources and Collection of Water

**Module 3:**

**Unit-I: Water Treatment Process**

Overview of Purification and Pre-Treatment, Theory and Design of Sedimentation, Theory and Design of Filtration, Theory and Design of Disinfection.

**Module 4:**

**Unit-I: Specific Treatments and Distribution**

Water Softening and Specific Treatments, Storage and Distribution Reservoirs, Pumps and Pumping Requirements, Valves and Appurtenances.

**Module 5:**

**Unit-I: Design Considerations**

Hydraulic Considerations and Design, Distribution Network-Analysis and Design

**Text Books:**

1. Water Supply Engineering: Dr. B.C. Punmia, Ashok Kr. Jain and Arun K Jain.

**Reference Books:**

1. Water Supply and Sanitary Engineering: G. S. Birdie and J. S. Birdie
2. Environmental Engineering: Howard S. Peavy, Donald R. Rowe and George Tchobanoglous
3. Environment and Ecology: Anuj Kumar Purwar
4. Water and Wastewater Technology: Mark J. Hammer Sr. and Mark J. Hammer Jr.

**E-Resources**

1. https://onlinecourses.swayam2.ac.in/nou21_ce02/preview

**Course Outcomes:**

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

1. Explain Different types of pollution and their effects.
2. Explain water quality parameters.
3. Explain design concepts of water treatment plants.
4. Understand Different water treatment techniques and distribution methodology.
5. Understand design considerations for water pipeline network.

<table>
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<tr><td><strong>Average</strong></td><td>2</td><td>1.4</td><td>1.3</td><td>1</td><td>-</td><td>1</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
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| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | | | B. Tech CE IV Year-I Sem | |
|---|---|---|---|---|---|
| Course Code: **L411J** | **SAFETY IN CONSTRUCTION** Professional Elective Course – V | L | T | P | D |
| Credits: 3 | **(MANDATORY MOOC)** | **3** | **0** | **0** | **0** |

**Pre-Requisites:**

## Module 1:

### Unit-I: Terminology and Accidents

Basic terminology in safety, types of injuries, safety pyramid, Accident patterns, theories of accident-causation.

## Module 2:

### Unit-I: Planning and Regulations

Planning for safety budget, safety culture, Introduction to OSHA regulations

## Module 3:

### Unit-I: Site safety Programs

Role of stakeholders in safety, Site safety programs - Job hazard analysis, accident investigation & accident indices-violation, penalty

## Module 4:

### Unit-I: Safety During Construction

Safety during construction, alteration, demolition works – Earthwork, steel construction, temporary structures, masonry & concrete construction, cutting & welding.

## Module 5:

### Unit-I: Safe Operating Procedures and BIM

SoPs (Safe Operating Procedures) – Construction equipment, materials handling-disposal & hand tools, other hazards – fire, confined spaces, electrical safety, BIM & safety

**Text Books:**
1. Hinze, J.W. (1997) Construction Safety, Prentice Hall

**Reference Books:**
2. MacCollum, D.V. (1995) Construction SafetyPlanning, John Wiley & Sons
3. Reese, C.D. & Eidson, J.V. (2006) Handbook ofOSHA Construction Safety and Health, Taylor & Francis.
4. Holt, A.S.J. (2005) Principles of Construction Safety,Wiley-Blackwell Publishers
5. MacCollum, D.V. (2007) Construction Safety Engineering Principles, McGraw Hill Publishers
6. Bhattacharjee, S.K. (2011) Safety Management in Construction, Khanna Publishers

**E Resources**
1. https://nptel.ac.in/courses/110105094

**Course Outcomes:**

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

1. Understand basic terminology of Safety in construction.
2. List out various safety regulations
3. Understand site safety norms and investigation techniques.
4. Understand various safety techniques to be followed during construction.
5. Understand various safe operating procedures in construction.

<table>
<tr><td colspan="14" align="center"><b>CO-PO/PSO Mapping Chart</b><br><br><b>(3/2/1 indicates strength of correlation)</b><br><br><b>3 – Strong; 2 – Medium; 1 - Weak</b></td></tr>
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<tr><td><b>CO5</b></td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td><b>Average</b></td><td>1.8</td><td>1.3</td><td>-</td><td>1</td><td>-</td><td>1.6</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
</table>

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology**<br>(UGC Autonomous) | **B. Tech CE**<br>**IV Year-I Sem** | | | |
|---|---|---|---|---|---|
| Course Code:<br>**L4111** | **COMPUTER AIDED DESIGN AND DRAFTING LAB** | L | T | P | D |
| Credits: 1 | | **0** | **0** | **2** | **0** |

**Pre-requisite:** Structural analysis

**LIST OF EXPERIMENTS:**

**EXPERIMENT 1** : Analysis of Beams (Simply Supported, cantilever).
**EXPERIMENT 2** : Analysis of Beams (continuous, fixed).
**EXPERIMENT 3** : Analysis of plane moment resisting frames subjected to dead and live loads.
**EXPERIMENT 4** : Analysis and design of multi-story frames (2D&3D) subjected to dead and live loads.
**EXPERIMENT 5** : Analysis of steel portal frames (industrial bent) subjected to dead, live and wind loads.
**EXPERIMENT 6**: Analysis and Design of Roof Truss subjected to dead, live and wind loads.
**EXPERIMENT 7**: Detailing of reinforcement in Beams using CAD software.
**EXPERIMENT 8**: Detailing of reinforcement in columns using CAD software.
**EXPERIMENT 9:** Detailing of reinforcement in footings (isolated, combined) using CAD software.
**EXPERIMENT 10**: Detailing of reinforcement in RC one-way, two-way slabs using CAD.
**EXPERIMENT 11**: Detailing of reinforcement in staircases in CAD.
**EXPERIMENT 12:** Drawing of Steel members and connections in CAD.

**Note:** At least any **Eight (10)** experiments must be conducted out of available **Eleven (12)** experiments.

**Course outcomes:**
On completion of the course, students will be able to:
1. **Analyze** the basic structural elements and interpret the results.
2. **Analyze** structural frames by using STADD Pro software.
3. **Describe** the different drawing annotations used in the structural drawing.
4. **Develop** drawings of reinforcement details of structural elements using CAD.
5. **Evaluate** results of different structural models under different loads and load combinations.

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - | 3 | 3 |
| CO2 | 3 | 2 | 2 | 1 | 3 | - | - | - | - | - | - | - | 2 | 3 |
| CO3 | - | - | - | - | 3 | - | - | - | - | - | - | - | 2 | 3 |
| CO4 | - | 3 | 1 | 1 | 2 | - | - | - | - | - | - | - | 1 | 2 |
| CO5 | - | 2 | 3 | 2 | 3 | - | - | - | - | - | - | - | 1 | 2 |
| Average | 1.2 | 1.8 | 1.6 | 0.8 | 2.2 | - | - | - | - | - | - | - | 1.8 | 2.6 |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 – Weak**

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | B. Tech CE IV Year-I Sem | | | |
|---|---|---|---|---|---|
| Course Code: **L411M1** | **BUILDING BYELAWS AND QUALITY STANDARDS** | L | T | P | D |
| Credits: 0 | | **2** | **0** | **0** | **0** |

**Pre-requisite:** Structural analysis

## Module 1:

### Unit-1: Building Byelaws and Regulations:

Introduction- terminology- objectives of building byelaws- floor area ratio- floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements.

## Module 2:

### Unit-1: Residential Buildings:

**Minimum** standards for various parts of buildings- requirements of different rooms and their grouping- characteristics of various types' residential buildings.

### Unit-2: Public Buildings:

**Planning** of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels & motels, buildings for recreation.

## Module 3:

### Unit 1: Sign Conventions and Bonds:

Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminum alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles. English bond and Flemish bond- odd and even courses for one, one-half, two and two & half brick walls in thickness at the junction of a corner.

### Unit 2: Doors, Windows, Ventilators and Roofs:

Panelled door, panelled and glassed door, glassed windows, panelled windows, swing ventilators, fixed ventilators, coupled roof, collar roofs. King Post truss, Queen Post truss Sloped and flat roof buildings: drawing plans, Elevations and Cross Sections of given sloped roof buildings.

## Module 4:

### Unit 1: Planning and Designing of Buildings:

Draw the Plan, Elevation, and sections of a Residential & Public buildings from the given line diagram. Good for construction drawings, documents, and drawings to be submitted for building permission and approval process.

## Module 5:

### Unit 1: Quality standard's:

Environmental exposure conditions of concrete (Table-3 of IS-456:2000) Minimum cover Acceptance criteria for concrete(Table-11 of IS-456:2000) Grade of concrete W/c ratio minimum cement content Grade of concrete and standard deviation values (table-8 of IS-456:2000),

Frequency of sampling of concrete Gradation specifications of coarse and fine aggregate(Table-2,Table-4 of IS-383-1970) coarse aggregate to fine aggregate ratio(Table-3 of IS 10262:2009) testing of concrete- NDT Expansion Joints (section-2 (27) IS456:2000).

**TEXT BOOKS**:
1. "Building planning and drawing" by Dr.N Kumaraswamy, A Kameswara Rao Charator publications 8th edition 2015.
2. Indian standard plain and reinforced concrete - code of practice (fourth revision) 10th Reprint April 2007 IS 456:2000

**REFERENCES:**
1. "Building planning and drawing" by S. S. Bhavikatti, M. V. Chitawadagi I.K. International Publishing House Pvt. Limited 2014.

**E-Resources:**
1. https://law.resource.org/pub/in/bis/S03/is.sp.7.1.2005.pdf

**Course outcomes:**
At the end of the course student will be able to:
1. **Describe** about the various Building byelaws and regulations.
2. **Explore** building drawing as a way of discovering and developing ideas for designing residential, commercial, and public buildings.
3. **Explain** about the sign conventions for the various material.
4. **Explain** about the different building elements and Develop basic drawing skills and working drawing.
5. **Explain** about the quality of RCC structures.

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| **CO1** | 1 | 2 | - | - | 1 | - | - | - | - | 1 | - | - | 1 | - |
| **CO2** | - | - | - | - | 2 | - | - | - | - | 2 | - | - | - | - |
| **CO3** | - | - | - | - | - | - | | - | - | 3 | - | - | 3 | - |
| **CO4** | - | - | - | - | - | - | 3 | - | - | - | - | - | 3 | - |
| **CO5** | - | - | - | - | - | - | | - | - | - | - | - | 3 | - |
| **Average** | 0.2 | 0.4 | - | - | 0.6 | - | 0.6 | - | - | 1.2 | | 0.2 | 2 | - |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 – Weak**

**Pre-Requisites:** Environmental Engineering.

**Module 1:**

### Unit-I: Fundamental of Urban Waste Management

Introduction to Urban Waste – Sources and impact of urban waste on environment, categories of urban waste –composition and its determinants of urban waste –factors influencing generation quality assessment of urban waste –methods of sampling and characterization.

**Module 2:**

### Unit-I: Waste collection and Transportation

Collection: Collection of Solid waste –collection services –collection system, equipment's– time and frequency of collection –labour requirement –factors affecting collection – analysis of collection system –collection routes –preparation of master schedules. Transfer station and Transport: Need for transfer operation- transfer stations-types-transport means and methods, location of transport stations, Design requirements, operation, and maintenance

**Module 3:**

### Unit-I: Waste processing techniques

Waste processing and reuse Processing technologies: Biological, chemical conversation technologies and thermal conversion technologies. Reuse of solid waste energy recovery – incineration- solidification and stabilization of hazardous waste- treatment of biomedical wastes

**Module 4:**

### Unit-I: Landfill Design and Operation

Waste disposal techniques Introduction, composting, principles of composting, factors affecting composting, vermi composting, waste to energy technique- Landfill technique and design and operating procedure of landfill. Solid waste management Hierarchy, waste reduction at source using 5r's Technique.

**Module 5:**

### Unit-I: Liquid waste management

Introduction, source, basic principles, characteristics, unit operation and unit process, maintenance, analysis of BOD and COD, flowchart of waste water treatment, sludge processing and disposal, Liquid waste reuse.

### Text Books

1. "Integrated Solid Waste Management" by Tchobanoglous, Theissen & Vigil, McGraw Hill Publication, 3rd Edition, 2014.

2. "Management of municipal Solid waste" by T V Ramachandra -TERI Press 2009.
3. "Wastewater engineering" by B.C Punmia, Laxmi Publications. Pvt Ltd. (2016).

**Reference Books**
1. "Solid Waste Management" By K.Sasi Kumar & S.Gopi Krishna. Prentice hall india learning pvt.                 2009.
2. "Integrated Solid Waste Management: Engineering Principles and Management Issues" by  George Tchobanoglous, Hilary Theisen, Samuel A. Vigil.

E-**Resources**
1. https://nptel.ac.in/courses/105/103/105103205/
2. https://nptel.ac.in/courses/105/106/105106119/

**Course Outcomes**
At the end of the course, the student will be able to:
1.  **Discuss** the Reuse of waste material.
2. **Explain** the collection system and transport of urban waste.
3. **Discuss** about Recycle of waste that cannot be used and recovery of resources.
4. **Explain** the design, operation and maintenance of landfills, incinerators and composting units.
5. **Describe** the liquid waste management

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | - | - | - | - | - | 3 | 1 | 2 | - | - | - | - | 2 | 1 |
| CO2 | - | 3 | - | - | - | 1 | - | - | - | - | - | - | 2 | 1 |
| CO3 | - | - | - | - | - | 1 | 3 | 2 | - | - | - | - | 1 | 1 |
| CO4 | - | - | 3 | - | 2 | - | 2 | 1 | - | - | - | - | 2 | 2 |
| CO5 | - | - | 1 | - | - | - | 3 | 1 | - | - | - | - | 2 | 2 |
| Average | - | 0.6 | 0.8 | - | 0.4 | 0.8 | 1.8 | 1.2 | - | - | - | - | 1.8 | 1.4 |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 - Weak**

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | | | **B. Tech CE** **IV Year-II Sem** | | |
|---|---|---|---|---|---|---|
| Course Code: **L421B** | **REHABILITATION AND RETROFITTING OF STRUCTURES** **(PE -VI)** | L | T | P | D | |
| Credits: 3 | | **3** | **0** | **0** | **0** | |

**Pre-Requisites:** Concrete Technology, Building Materials, Construction and Services.

## Module 1:

### Unit1: Introduction:

Deterioration of Structures, Distress in Structures, Causes and Prevention. Mechanism of Damage, Types of Damage-Types of Cracks-Analysis of Failures.

### Unit-2: Terminology:

Rehabilitation, Retrofitting, Repair, Strengthening, Maintenance of structures.

## Module 2:

### Unit 1: Corrosion of Steel Reinforcement:

Causes – Mechanism and Prevention.

### Unit 2: Damage of Structures due to Fire

Fire Rating of Structures – Phenomenon of Desiccation.

## Module 3:

### Unit 1: Inspection and Testing:

Symptoms and Diagnosis of Distress - Damage assessment –Investigation techniques- Non-Destructive Testing (NDT)- Ultrasonic pulse velocity test, Rebound hammer test, Penetration resistance test, Windsor probe, Pull out test, Flexure test

## Module 4:

### Unit 1: Repair of Structures:

Common Types of Repairs, Repair in Concrete Structures - Repairs in Underwater Structures-Repair Techniques – Epoxy injection – Guniting – Shotcreting–Underpinning.

## Module 5:

### Unit 1: Strengthening of Structures:

Strengthening Methods – Retrofitting – Jacketing.

### Unit 2: Health Monitoring of Structures:

Methodology- advantages -Use of Sensors-Instrumentation.

Case studies on building and bridges subjected deterioration and distress of concrete.

**Text Books :**

1. ""Concrete Repair and Maintenance Illustrated" by RS Means Company Inc W. H. Ranso, (2002).
2. "Building Failures: Diagnosis and Avoidance" by E F&N Spon by W.H.RANSON, Taylor & Francis Group (19 November 1987).
3. "Concrete Technology" by A.R. ShanthaKumar,Oxford University Press (1 April 2018).
4. "Maintenance and Repair of Civil Structures" by B.L. Gupta and Amit Gupta, Standard

Publications. (2009).

5. "Repair and Rehabilitation of Structures" by Dr.K.Sumitra, SreeKamalmani, (2019)

**Reference Books:**

1. "Defects and Deterioration in Buildings" by Barry Richardson, Consulting Scientist, Winchester, UK.Routledge (30 November 2000).
2. "Acoustic Emission and Related Non-destructive Evaluation Techniques in the Fracture Mechanics of Concrete: Fundamentals and Applications "by MasayasuOhtsu(1 October 2020) Woodhead Publishing.
3. "Non-Destructive Evaluation of Concrete Structures" by Bungey, Woodhead Publishing (4June 2010).
4. "Maintenance, Repair & Rehabilitation and Minor Works of Buildings" by P.C.Varghese,Publisher : Prentice Hall India Learning Private Limited (1 January 2014).

**E-Resources :**
1. https://nptel.ac.in/courses/105/102/105102176/
2. https://nptel.ac.in/courses/105/106/105106202/

**Course Outcomes :**

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

1. **Describe** the defects and deterioration of structures.
2. **Apply** the Mechanisms of degradation in Reinforced concrete structures.
3. **Discuss** about repair of structures and evaluate applications.
4. **Describe** the specific repairs in under water structures and the constraints.
5. **Explain** the building health monitoring structures.

<table>
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<tr><td><strong>Average</strong></td><td>1</td><td>1.8</td><td>2.4</td><td>1.4</td><td>0.6</td><td>0.4</td><td>0.2</td><td>0.8</td><td>-</td><td>-</td><td>-</td><td>2</td><td>2</td><td>2</td></tr>
</table>

| Course Code: **L421C** | **ADVANCED STRUCTURAL ENGINEERING (PE–VI)** | L | T | P | D |
|---|---|---|---|---|---|
| Credits: 3 | | **3** | **0** | **0** | **0** |

**Pr-Requisites:** Structural Engineering –I **(RCC),** Structural Analysis-I.

## Module 1:

### Unit-I: Design of retaining wall

Design of cantilever and counter fort retaining wall -stability check -with & without surcharge.

### Unit-II: shear wall

Shear wall design -ductile detailing.

## Module 2:

### Unit-I: Flat slabs

Introduction, Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat Slabs-Check for one way and two-way shears – IS Codal provisions. Design of flat slabs (Interior panel only) & shear walls-ductile detailing.

## Module 3:

### Unit-I: Water Tank

Design principles and IS codal provisions for RCC water tanks, Design principles of underground water tank & overhead circular water tank.

## Module 4:

### Unit-I: Bunkers & Silos

Design of concrete bunkers of circular shape – Introduction to silos.

## Module 5:

### Unit-I: Girders

Design specification of steel plate girders as per IS-800.

### Text Books:
1. "Advanced R.C.C" by KrishnamRaju, CBS Publishers & distributors, New Delhi 3$^{rd}$ edition 2016.
2. "Structural Design and drawing (RCC and steel) " by KrishnamRaju, Univ.Press , New Delhi 3$^{rd}$ edition 2016.

### Reference Books:
1. "R.C.C Structures" by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications, New Delhi. 1$^{st}$ edition 2015.

### E-Resources :
1. https://nptel.ac.in/courses/105/105/105105104/

**Course Outcomes**

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

1. **Understand** the loading and design principles involved in retaining walls, shear walls, water tanks, bunkers and silos, gantry girder.
2. **Remember** the codal provision available in the design of flat slabs, water tanks, plate girder.
3. **Analyse** the retaining walls and water tanks, gantry girder for the possible forces and perform stability checks.
4. **Evaluate** the available equations the design of bunkers and silos, gantry girder.
5. **Design** the retaining wall, plate girder and flat slabs.

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<tr><td><b>Average</b></td><td>-</td><td>2</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>2</td><td>-</td></tr>
</table>

**Module 1:**

**Unit-1: Introduction:**

History of the civil engineering, sub – disciplines of civil engineering.

**Module 2:**

**Unit-1: Surveying**

Introduction, divisions of surveying, classification of surveying, principles of surveying. Linear measurements and errors–introduction, methods of linear measurements, chaining instruments, types of error and correction. Compass surveying – introduction, angular measurement using compass, whole circle bearing and reduced bearing, fore bearing, and back bearing. Traverse surveying –introduction, chain, and compass traversing, closing error and adjustments. Levelling–introduction, types of levelling instruments, dumpy level, adjustment of level, levelling staff

**Module 3:**

**Unit-1: Building Materials and Construction**

Materials: Introduction to construction materials like ferrous and nonferrous metals, alloys, Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete, and bitumen. Construction: Types of building, different loads considered in building design, types of foundation in building, other developments, and constructions of buildings

**Module 4:**

**Unit-1: Fire and Earthquake Protection in Building:**

Introduction, fire protection in building, structural and architectural safety requirements of resistive structures, fire resistive properties of building materials, fire exit requirements, force and acceleration on building due to earthquake, building response characteristics, building drift

**Module 5:**

**Unit-1: Water Supply, Sanitary and Electrical Works in Building:**

Introduction, water supply system, water supply layout of a building, house drainage, traps, electrical works in building.

**Unit-2: Highway Engineering:**

Introduction, historical background of road or highway, classification of roads, pavements and roads, traffic control mechanism.

**Text Books :**

1. "Elements of Civil Engineering'' by Mimi Das Saikia, Bhargab Mohan Das and Madan Mohan Das, PHI Learning Private Limited New Delhi.

2. "Elements of Civil Engineering'' by Dr. R.K. Jain and Dr. P.P. Lodha, McGraw Hill Education, India Pvt. Ltd.

3. "Surveying Vol. I'' by Dr. B. C. Punmia, Ashokkumar Jain, Arunkumar Jain16th Edition Publisher: Laxmi Publication Delhi.

**Reference Books**

1. "Surveying Theory and Practice" by James M Anderson and Edward M Mikhail McGraw Hill Education, India Pvt. Ltd. (7th Edition).

2. "Surveying and Leveling" by R. Subramanian, Oxford University.

3. "Building drawing" by M.G.Shah, C.M.Kale and S.Y.Patki,Tata McGraw Hill.

4. "Civil Engg. Drawing" by S. C. Rangwala, Charotar Pub. House Anand.

**E-Resources:**

1. https://nptel.ac.in/courses/105/106/105106201/

**Course Outcomes**

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

1. Explain the basic requirements of civil engineering components.

2. Evaluate area for irregular shaped bodies.

3. Explain the various building materials.

4. Plan the building against the fire.

5. Discuss the highway development in India.

### CO-PO/PSO Mapping Chart

### (3/2/1 indicates strength of correlation)

### 3 – Strong; 2 – Medium; 1 - Weak

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

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | | **B. Tech CE** **III Year-II Sem** | | |
|---|---|---|---|---|---|
| Course Code: **L32OA** | **CONSTRUCTION MANAGEMENT, CONTRACTS AND VALUATION** | L | T | P | D |
| Credits: 3 | **(OE-II)** | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Construction Technology and Project Management, Estimation and Costing.

## Module 1:

### Unit-I: Concept of a Project
Characteristic features – Project Life cycle – Phases – Project Management – tools and techniques for project management – role of project managers.

## Module 2:

### Unit-I: Project management plan and objectives
Programming – scheduling – project organization – organization and project team – role of communication in project management – controlling systems.

## Module 3:

### Unit-I:Safety Management Function
Importance of safety in construction industry, Line versus staff authority, Safety responsibility and accountability in construction industry, Safety organizations, Role of various parties, duties, responsibilities of top management, site managers, supervisors etc., Role of safety officers, Responsibilities of general employees, Safety administration.

## Module 4:

### Unit-I:  Types of contract documents
Essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms – Tender, earnest money deposit, security deposit, tender forms, documents, and types. Acceptance of contract documents. Termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval – Technical sanction. Nominal muster roll, measurement books – procedure for recording and checking measurements – preparation of bills.

## Module 5:

### Unit-I:Valuation
Types of value, purposes of valuation factors affecting value. Different methods of valuation for different types of assets such as land and building, horticulture, historical places. Valuation Report, contents, standard formats, Case study of any one Report.

**Text Books**
1. "Construction Technology" by Subira K. Sarkar, Subhajit Saraswathi / Oxford University Press, 3rd edition, Apr 2009.
2. "Project management- strategic Financial Planning, Evaluation and Control" by B M Patel, Vikas Publishing House Pvt. Ltd. New Delhi, 2nd edition oct 2000.

**Reference Books**
1. "Total Construction Project Management" by George J.Ritz , McGraw-Hill Inc, 2nd edition Jan 2013.
2. "Construction Project Management Planning, Scheduling and Control" by K K Chitkara.

**E-Resources**
1. https://nptel.ac.in/courses/105/103/105103093/
2. https://nptel.ac.in/courses/105/103/105103023/

**Course Outcomes**
At the end of the course, the student will be able to:
1. **Describe** the different approaches for successful handling of the project
2. **Apply** different plans and schedules for the development of the project.
3. **Describe** the importance of safety management in construction industry.
**4. List** out the different tenders and contract document for a construction project.
**5. Evaluate** the different types of reports for different construction projects

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 2 | 1 | - | - | 2 | 1 | - | - | 2 | - | 3 | 1 | 1 | - |
| CO2 | 2 | 1 | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 | - |
| CO3 | 2 | 1 | - | - | - | 3 | - | - | - | - | - | 1 | 1 | - |
| CO4 | 2 | 1 | - | - | - | 2 | - | - | - | - | 3 | - | 1 | - |
| CO5 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | - | 1 | - |
| Average | 2 | 1.4 | 0.4 | - | 0.4 | 1.2 | - | - | 0.4 | - | 2 | 0.8 | 1.4 | - |

**CO-PO/PSO Mapping Chart**

**(3/2/1 indicates strength of correlation)**

**3 – Strong; 2 – Medium; 1 - Weak**

**Pre-Requisites: NIL**

## Module 1: Fundamentals of Traffic Engineering

**Unit-I:**

Road User Characteristics, Vehicular Characteristics, Applications of Traffic Control Devices, Traffic signs, Road Marking.

## Module 2: Introduction to Road Safety

**Unit-I:**

Accident Situation in India, International Comparison of Accident Data, Standard Definitions by IRC, Collection of Accident Data, Collision and Condition Diagrams.

## Module 3: Statistical Methods and Analysis of Accident Data

**Unit-I:**

Methods in Analysis of accident Data, Regression Method, Poisson Distribution, Chi- Squared Distribution, Statistical Comparisons, Black Spot Identification & Investigations.

## Module 4: Road & its Effect on Accidents

**Unit-I:**

Factors Causing Accidents, Skidding, Factors Determining Skid Resistance, Pedestrian Safety, Measures to Increase Pedestrian Safety, Safety Improvement Strategies.

## Module 5: Accident Mitigation Measures

**Unit-I**

Accident prevention by better planning, Accident prevention by better design of roads, Highway operation and accident control measures, Highway Safety Measures during construction, Highway geometry and safety.

**Text Books**
1. 'Transport planning and Traffic Engineering" by Dr. L. R. Kadiyali, Khanna Publications 9th Edition (2017).
2. 'Principles of Transportation Engineering'' by Partha Chakroborty &Aminesh Das; Prentice Hall of India, 2nd edition (October 2017).

**Reference Books**
1. Fundamentals of Traffic Engineering, Richardo G Sigua

2. Road Safety by NCHRP.

**E- Resources**

1. https://nptel.ac.in/courses/105/101/105101087/

**Course Outcomes**

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

**1.** Understand the Traffic characteristics

**2.** Analyze Collision and Condition Diagrams.

**3.** Describe Road & its Effect on Accidents

**4.** Understand the various Accident prevention measures.

**5.** Understand the statistical analysis of traffic flow variables.

| CO-PO/PSO Mapping Chart |||||||||||||||
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (3/2/1 indicates strength of correlation) |||||||||||||||
| 3 – Strong; 2 – Medium; 1 - Weak |||||||||||||||
| Course Outcomes (COs) | Program Outcomes (POs) |||||||||||| Program Specific Outcomes* ||
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 |
| CO2 | 1 | 1 | 1 | - | - | 3 | 2 | - | - | - | - | - | 2 | 2 |
| CO3 | 1 | 1 | 1 | - | - | 3 | 1 | - | - | 2 | - | 2 | 1 | 1 |
| CO4 | 1 | 1 | 1 | - | - | 2 | - | - | - | - | - | 2 | 1 | 2 |
| CO5 | 1 | 1 | 1 | - | - | 2 | - | - | - | - | - | 2 | 1 | 1 |
| Average | 1 | 1 | 1 | - | - | 2 | 0.6 | - | - | 0.4 | - | 1.2 | 1.2 | 1.4 |

**Pre-Requisites:** Environmental Science.

### Module 1:
**Unit-1:** Initial Environmental examination –Factors affecting EIA – Need for Environmental Impact Assessment (EIA), Rapid and Comprehensive EIA, Environmental Impact statement (EIS) – EIA capability and limitations – Legal provisions on EIA – stages of EIA.

### Module 2:
**Unit-1:** Role of NEPA in EIA, CEQ, Environmental documents. EIA/ EIS& FONSI relationship, processing of EIA/EIS, Environmental attributes.
**Methodologies**: Criteria to be considered for the selection of EIA methodologies, Adhoc, overlays, Check lists – Matrices – Networks – Cost-benefit analysis with their advantages and limitations.

### Module 3:
**Unit-1:** EIA guidelines for Development Projects, Prediction and Assessment – Assessment of Impact on land, water, air, and noise. Social and cultural activities and on flora and fauna – mathematical models – public participation, Forest act 1980, Wild life Protection Act-1972, The water (Prevention and control) Act-1974.

### Module 4:
### Unit-1: Environment management plan:
Plan for mitigation of adverse impact on Environment – Options for mitigation of impact on water, air, land and on flora and fauna – Addressing the issues related to project affected people. Post project monitoring. ISO 9000, 14000 & 18000.

### Module 5:
### Unit-1:
EIA for Water resource developmental projects, Highway projects: Nuclear Power plant projects, Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities.

### Text Books
1. "Environmental Impact Assessment" by S.R. Khandeshwar N.S. Raman, A.R. Gajbhiye, I k international house publishing, pvt ltd. 1st addition Sep 2019.
2. "Environmental Impact Assessment" by Barthwell, R. R. New Age International Publications. 3rd addition Oct 2017.

### Reference Books

1. "Environmental Impact Analysis" by Jain R.K.-Van Nostrand Reinhold Co, H K E S international publication, 3rd addition oct 2014.
2. "Environment Impact Assessment" by Anjaneyulu, B S Publication, 2nd addition Jan 2010

**Web Resources**
1. https://nptel.ac.in/courses/120/108/120108004/

**Course Outcomes**

On completion of the course, the students will be able to:
1. **Explain** the stages and need for environmental impact assessment.
2. **Discuss** different methodologies for environmental impact prediction and assessment.
3. **Evaluate** the environmental management plans.
4. **Solve** the problems associated with adverse impact on environment.
5. **Apply** the knowledge of EIA on different construction projects.

<table>
<tr><td colspan="16"><strong>CO-PO/PSO Mapping Chart</strong><br><br><strong>(3/2/1 indicates strength of correlation)</strong><br><br><strong>3 – Strong; 2 – Medium; 1 - Weak</strong></td></tr>
<tr><td rowspan="2"><strong>Course Outcomes (COs)</strong></td><td colspan="12"><strong>Program Outcomes (POs)</strong></td><td colspan="2"><strong>Program Specific Outcomes</strong></td></tr>
<tr><td><strong>PO 1</strong></td><td><strong>PO 2</strong></td><td><strong>PO 3</strong></td><td><strong>PO 4</strong></td><td><strong>PO 5</strong></td><td><strong>PO 6</strong></td><td><strong>PO 7</strong></td><td><strong>PO 8</strong></td><td><strong>PO 9</strong></td><td><strong>PO 10</strong></td><td><strong>PO 11</strong></td><td><strong>PO 12</strong></td><td><strong>PSO 1</strong></td><td><strong>PSO 2</strong></td></tr>
<tr><td><strong>CO1</strong></td><td>-</td><td>2</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>1</td></tr>
<tr><td><strong>CO2</strong></td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>3</td><td>1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>1</td></tr>
<tr><td><strong>CO3</strong></td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>2</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>1</td></tr>
<tr><td><strong>CO4</strong></td><td>-</td><td>2</td><td>-</td><td>-</td><td>-</td><td>1</td><td>2</td><td>3</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>3</td></tr>
<tr><td><strong>CO5</strong></td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>3</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>2</td><td>2</td></tr>
<tr><td><strong>Average</strong></td><td>-</td><td>0.8</td><td>-</td><td>-</td><td>-</td><td>1.4</td><td>2.4</td><td>2.4</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1.6</td><td>1.6</td></tr>
</table>

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | | **B. Tech CE** **IV Year – II Sem** | | | |
|---|---|---|---|---|---|---|
| Course Code: **L42OA** | **ENERGY AUDIT & GREEN BUILDINGS** (Open Elective – V) | | L | T | P | D |
| Credits: **3** | | | **3** | **0** | **0** | **0** |

**Pre-requisite:** Green buildings

### Module 1:

### Unit 1: Energy Scenarios:

Energy Conservation-Energy Audit-Energy Consumption-Energy Security-Energy Strategy-Clean Development Mechanism.

### Unit 2: Types of Energy Audits and Energy-Audit Methodology:

Definition of Energy Audit-Place of Audit-Energy- Audit Methodology-Financial Analysis-Sensitivity Analysis-Project Financing Options-Energy Monitoring and Training

### Module 2:

### Unit 1: Environmental Audit:

Environmental Audit; Introduction-Necessity-Norms. Types: Objectives-Bases types; Liabilities Audit-Management Audit-Activities Audit-Client drive and types; regulatory external audits-independent external audit-internal environmental audit -third party audit.

### Unit 2: Environmental Impact Assessment:

Introduction-EIA regulations-Steps in Environmental impact assessment process benefits of EIA-limitations of EIA-Environmental Clearance for Civil Engineering Projects.

### Module 3:

### Unit 1: Energy Sources:

Renewable and Non-renewable sources of energy - Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources, potential of these sources, hazards

### Unit 2: Energy Conservation:

Introduction-Specific objectives-need of energy conservation-LEED India rating system and Energy Efficiency.

### Module 4:

### Unit 1: Green Building:

Introduction-Definition-Benefits-Principles; Planning concept of Green Building- Salient features of Green Building-Environmental Design-Strategies for Building Construction- Process; Improvement in Environmental Quality in Civil Structure. Materials; Bamboo, Rice Husk Ash, Concrete, Plastic Bricks-Reuse of waste materials- Plastic, Rubber, News Paper, Wood, Non-Toxic paint, Green roofing.

### Module 5:

### Unit 1: Rating system for Green Building:

Leadership in Energy and Environmental Design (LEED) Criteria-Indian Green Building Council (IGBC) Green Rating-Green Rating for Integrated Habitat Assessment (GRIHA) criteria-HVAC unit in Green Building-Certification Programs (including GEM and ECBC Certifications).

**TEXT BOOKS**:

1. "Sustainable construction: Green Building design and delivery" by Kibert, C.J(John Wiley Hoboken, New Jersey).

2. "Non-Conventional Energy resources" by Chauhan, D S Sreevasthava, S K (New Age International Publishers, New Delhi).

3. "Alternative Building Materials and Technologies" by Jagadeesh, K S, Reddy Venkatta Rama, Nanjunda Rao K S (New Age International Publishers, New Delhi).

4. "Green Buildings" by Gevorkian (McGraw hill publication).

**REFERENCES:**

1. "Handbook of Green Building Design and Construction" by Sam Kubba (Butterworth-Heinemann).

2. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design.

3. Energy Conservation Building Code 2017.

**E-Resources:**

1. https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-ce06

2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ce40

**Course outcomes:**

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

1. Differentiate and select best of various energy scenarios and energy auditing methodology

2. Identify various Renewable and Non-renewable sources of energy.

3. Justify others to use the waste materials efficiently and effectively.

4. Explain the application of design guidelines of Green Building considering the Energy Conservation Measures.

5. Discuss the building codes, relevant legislation governing the consumption of resources.

<table>
<tr><td colspan="15" align="center"><b>CO-PO/PSO Mapping Chart</b><br><br>(3/2/1 indicates strength of correlation)<br><br>3 – Strong; 2 – Medium; 1 – Weak</td></tr>
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<tr><td><b>CO1</b></td><td>1</td><td>2</td><td>1</td><td>1</td><td>-</td><td>1</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>1</td></tr>
<tr><td><b>CO2</b></td><td>1</td><td>2</td><td>1</td><td>1</td><td>-</td><td>2</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td><td>-</td></tr>
<tr><td><b>CO3</b></td><td>2</td><td>1</td><td>2</td><td>1</td><td>-</td><td>1</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>1</td></tr>
</table>

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO4** | 1 | 1 | 1 | 1 | - | 2 | 2 | - | - | - | - | - | 1 | 1 |
| **CO5** | - | 1 | 1 | 1 | - | 1 | 2 | - | - | - | - | - | 1 | - |
| **Average** | 1 | 1.4 | 1.2 | 1 | - | 1.4 | 2 | - | - | - | - | - | 0.8 | 0.6 |

# OPEN ELECTIVE-I

**Module 1:**

**Unit-1: Introduction:**

History of the civil engineering, sub – disciplines of civil engineering.

## Module2

## Unit-1: Surveying

Introduction, divisions of surveying, classification of surveying, principles of surveying. Linear measurements and errors–introduction, methods of linear measurements, chaining instruments, types of error and correction. Compass surveying – introduction, angular measurement using compass, whole circle bearing and reduced bearing, fore bearing, and back bearing. Traversesurveying –introduction, chain, and compass traversing, closing error and adjustments. Levelling– introduction, types of levelling instruments, dumpy level, adjustment of level, levelling staff

## Module 3: Unit-1: Building Materials and Construction

Materials: Introduction to construction materials like ferrous and nonferrous metals, alloys, Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete, and bitumen. Construction: Types of building, different loads considered in building design, types of foundation in building, other developments, and constructions of buildings

## Module 4: Unit-1: Fire and Earthquake Protection in Building:

Introduction, fire protection in building, structural and architectural safety requirements of resistive structures, fire resistive properties of building materials, fire exit requirements, force and acceleration on building due to earthquake, building response characteristics, building drift

## Module 5: Unit-1: Water Supply, Sanitary and Electrical Works in Building:

Introduction, water supply system, water supply layout of a building, house drainage, traps,electrical works in building.

## Unit-2: Highway Engineering:

Introduction, historical background of road or highway, classification of roads, pavements androads, traffic control mechanism.

## Text Books :

1. "Elements of Civil Engineering'' by Mimi Das Saikia, Bhargab Mohan Das and Madan Mohan Das, PHI Learning Private Limited New Delhi.

2. Elements of Civil Engineering'' by Dr. R.K. Jain and Dr. P.P. Lodha, McGraw Hill Education,India Pvt. Ltd.

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2. "Surveying and Leveling" by R. Subramanian, Oxford University.
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4. "Civil Engg. Drawing" by S. C. Rangwala, Charotar Pub. House Anand.

## E-Resources:
1. https://nptel.ac.in/courses/105/106/105106201/

## Course Outcomes

On completion of the course, the students will be able to:
1. Explain the ba sic requirements of civil engineering components.
2. Evaluate area for irregular shaped bodies.
3. Explain the various building materials.
4. Plan the building against the fire.
5. Discuss the highway development in India.

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

**CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak**

| AY: 2022-23 Onwards | **J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY** (UGC Autonomous) | **B. Tech-CSE** **IV Year- II Sem** | | | |
|---|---|---|---|---|---|
| Course Code: L31OB | **Introduction to Computer Networks** **(Open Elective -I)** | L | T | P | D |
| Credits: **3** | | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Knowledge on Programming for Problem Solving

**Course Objectives:**

The students should be able to

1. Understand importance of Internet, Computer networks, and their elements
2. Identify the data link layer design Issues and protocols.
3. Examine design issues of network layer and corresponding protocols.
4. Identify the transport layer services and demonstrate the working of its protocols.
5. Identify the application layer services, protocols like HTTP, FTP, E-Mail etc.

**Module 1:**

**Overview of the Internet:** Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Comparison of the OSI and TCP/IP reference model.

**Physical Layer:** Guided transmission media, wireless transmission media.

**Connecting Devices:** Repeaters, Hubs, Switches, Gateways and Bridges.

**Module 2:**

**Data Link Layer:** Design issues, Framing, Error Detection and Error Correction, Block Coding, Hamming Distance, CRC, Flow control and error Control.

**Protocols:** Noiseless Channels, Noisy Channels

**Multi Access protocols-** Random access - ALOHA, CSMA, CSMA/CD and CSMA/CA, Controlled access, Channelization

**Module 3:**

**Network Layer**: Network layer design issues, Store and forward packet switching, connection less and connection-oriented network services.

**Internetworking:** Protocols-IPV4 and IPV6**,** Logical Addressing-IPV4, IPV6, Tunnelling and Packet Fragmentation.

**Address Mapping**: ARP, RARP, DHCP, ICMP and IGMP.

   **Routing Algorithms**: Shortest Path Finding and Distance Vector Routing Algorithms.

**Module 4:**

**Transport Layer:** Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), The TCP Connection Establishment, The TCP Connection Release, The TCP sliding window, The TCP congestion control.

**Module 5:**

**Application Layer:** Introduction, services, Application layer paradigms.

**Applications:** DNS, WWW, HTTP, FTP, E-MAIL, TELNET, SNMP, SSH.

**Textbooks**

1. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.

**Reference Books**

1. Computer Networks,5E, Peterson, Davie, Elsevier

2. Introduction to Computer Networks and Cyber Security, Chawan -HwaWu, Irwin, CRC Publications.
3. Computer Networks and Internets with Internet Applications, Comer.

### E - Resources:

1. https://lecturenotes.in/subject/2234/Computer_Network
2. http://nptel.ac.in/courses/106102234/
3. https://www.iitg.ernet.in/dgoswami/CN-Notes.pdf
4. http://www.coursera.org/
5. http://ocw.mit.edu/index.htm.

## Course Outcomes

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

**CO1**. Demonstrate the networking concepts, various Layering approaches, functionalities and internetworking devices used and some protocols of Link layer.

**CO2**. Identify how error control, flow control can be achieved, and a medium can be shared among multiple devices,

**CO3**. Identify how to do fragmentation, assigning of logical address and judge on routing, congestion.

**CO4**. Illustrate the working of IP Protocol, other protocols of internet layer and services of transport layer.

**CO5**. Demonstrate the transport layer and application layer protocols, their working.

| AY 2022-23 onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | | B. Tech: AI&ML III Year / I Sem | | | |
|---|---|---|---|---|---|---|
| Course Code: **L310C** | **INTRODUCTION TO MACHINE LEARNING** (Open Elective I) | | **L** | **T** | **P** | **D** |
| **Credits: 3** | | | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Data Structures, Design and Analysis of Algorithms, Python Programming & Mathematics for Machine Learning

**Course objectives:**

**The student will:**

1. To introduce the fundamental concepts of machine learning and its applications.

2. To learn the classification, clustering, regression-based machine learning algorithms

3. To understand the deep learning architectures.

4. To understand the methods of solving real life problems using the machine learning techniques.

5. Understand the limitations of machine learning algorithms.

**Module 1:**

**Introduction:** Programming Vs Learning-Types of Learning- Statistical Decision Theory – Regression-Classification- Bias Variance-Linear Regression- Multivariate Regression- Subset Selection- Shrinkage Methods

Principal Component Regression- Partial Least squares- Linear Classification- Logistic Regression- Linear Discriminant Analysis-Perceptron- Support Vector Machines

**Module 2:**

**Neural Networks**-Introduction- Early Models- Perceptron Learning- Backpropagation- Initialization- Training & Validation- Parameter Estimation – MLE- MAP-Bayesian Estimation

**Decision Trees**- Regression Trees- Stopping Criterion & Pruning loss functions- Categorical Attributes- Multiway Splits- Missing Values- Decision Trees – Instability Evaluation Measures

**Module 3:**

**Ensemble Learning-**Bootstrapping & Cross Validation-Class Evaluation Measures- ROC curve- MDL- Ensemble Methods – Bagging- Committee Machines and Stacking- Boosting

Gradient Boosting- Random Forests- Multi-class Classification- Naive Bayes- Bayesian Networks

**Module 4:**

Undirected Graphical Models- HMM- Variable Elimination-Belief Propagation-Partitional Clustering, Hierarchical Clustering

Birch Algorithm, CURE Algorithm, Density-based Clustering- Gaussian Mixture Models Expectation Maximization

**Module 5:**

Deep Learning Architectures and Applications: Convolution neural networks (CNN) - Layers in CNN - CNN architectures.

Recurrent Neural Network. Applications: Speech-to-text conversion- image classification-time series prediction. Recent trends in various learning techniques of machine learning and classification methods for solving real world problems.

**Text Books:**

1. The Elements of Statistical Learning, by Trevor Hastie, Robert Tibshirani, Jerome H. Friedman (2009). Springer-Verlag.

2. Pattern Recognition and Machine Learning, by Christopher Bishop, Springer 2006

3. Richard S. Sutton and Andrew G. Barto, "Reinforcement learning: An introduction", Second Edition, MIT Press, 2019

4. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Third Edition, 2014.

**Reference Books:**

1. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.

2. Francois Chollet, "Deep Learning with Python, Manning Publications, Shelter Island, New York, 2018.

3. Navin Kumar Manaswi, Deep Learning with Applications using Python, Apress, New York, 2018.

**Course outcomes:**

**The student will be able to:**

1. Identify the basic concepts of machine learning.

2. Predict the various classification, clustering, and regression algorithms.

3. Apply the deep learning architectures for real world problems.

4. Implement a method for solving real life problem using a suitable machine learning technique.

5. Prioritize the various Machine Learning algorithms.

## Module I: Introduction to Data Science & Big Data

### Unit 1:

Evolution of Data Science, Data Science Roles, Stages in a Data Science Project, Applications of Data Science in various fields, Data Security Issues.

### Unit 2:

Introduction to Big Data, Elements of Big Data, Big Data Classification, Structured, Un Structured and Semi Structured Data

## Module II: Data Collection and Data Pre processing

Unit 1: Data Collection Strategies, Data Pre-Processing Overview

Unit 2: Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization

## Module III: Exploratory Data Analytics

### Unit 1:

Introduction to Exploratory Data Analytics, Visualization the data (Histogram, bar plot, box plot, pie chart, scatter plots)

### Unit 2:

Descriptive Statistics, Mean, Standard Deviation, Skewness and Kurtosis, Box Plots, Pivot Table, Correlation Statistics, ANOVA

## Module IV: Model Development

### Unit 1:

Introduction to Regression, Simple and Multiple Regression, Model Evaluation using Visualization

### Unit 2:

Residual Plot, Distribution Plot, Polynomial Regression and Pipelines, Measures for In-sample Evaluation, Prediction and Decision Making.

## Module V: Model Evaluation

### Unit I:

Generalization Error, Out-of-Sample Evaluation Metrics, Cross Validation, Overfitting, Under Fitting and Model Selection.

### Unit II:

Prediction by using Ridge Regression, Testing Multiple Parameters by using Grid Search.

### REFERENCES:

1. Jojo Moolayil, "Smarter Decisions: The Intersection of IoT and Data Science", PACKT, 2016.
2. Cathy O'Neil and Rachel Schutt , "Doing Data Science", O'Reilly, 2015.
3. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big Data Analytics",     EMC 2013
4. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global.

### Course outcomes:

1. Analyze the fundamental concepts  of Data Science.
2. Evaluate the Data analysis and Data Science Process and Linear Regression.

3. Analyze the various methods of Data Analysis.
4. Apply the Basics of R in its Environment
5. Evaluate the Data Science analysis using R programming and Data Visualization

**Pre-Requisites:** Basic electronics and Electricals

**Course Objectives**: Distinguish analog and digital Modulation techniques used in various Communication systems.

## Module 1: Introduction [10L]

### Unit-I: [6L]

Block diagram of Electrical communication system, Radio communication: Types of communications, analog, pulse and digital types of signals, Introduction to Modulation, Need for Modulation,

### Unit-II: [4L]

**Amplitude Modulation:** Ordinary Amplitude Modulation – Modulation index, Side bands, AM Power, Double Side Band Suppressed Carrier Modulation, Single Side Band Modulation, Vestigial Side Band Modulation, AM demodulation, Applications of AM.

## Module 2: Angle Modulation [9L]

### Unit-I: [5L]

**Angle Modulation:** Phase Modulation fundamentals, Frequency Modulation – Modulation index and sidebands, Narrowband FM, Wideband FM, Comparison of Phase Modulation and Frequency Modulation verses Amplitude Modulation, FM demodulation, Applications of FM.

### Unit-II: [4L]

Types of noise, sources of noise, calculation of noise in Linear systems and noise figure.

## Module 3: Pulse Modulations [8L]

### Unit-I: [4L]

**Signal Sampling and Analog Pulse Communication:**

Sampling, Nyquist rate of sampling, sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM.

### Unit-II: [4L]

Time Division Multiplexing, Frequency Division Multiplexing, Asynchronous Multiplexing.

## Module 4: Digital Communication [10L]

### Unit-I: [5L]

Advantages, Block diagram of PCM, Quantization, and effect of quantization, quantization error, Base band digital signal, DM, ADM, DPCM and comparison.

### Unit-II: [5L]

**Transmission of Binary Data in Communication Systems:** ASK, FSK, PSK, DPSK, QPSK demodulation, coherent and incoherent reception,

## Module 5: Information Theory [9L]

### Unit-I: [5L]

Concept of information, rate of information and entropy, Source coding for optimum rate of information, coding efficiency,

### Unit-II: [4L]

Shanon-Fano and Huffman coding and its problems

## Text Books

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

## Reference Books

1. Electronic Communication Systems – Kennedy and Davis, TMH , 4th edition, 2004.
2. Communication Systems Engineering -John. G. Proakis and MasoudSalehi, PHS, 2nd ed.2004.

1. https://nptel.ac.in/courses/Nanoelectronics/ IIT    Madras/ab1011/102/111102111/

**Course Outcomes**

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

CO1. **Illustrate** the main concepts of analog and digital communication systems.

**CO2**. **Analyze** the AM and FM modulator/demodulator

**CO3**. **Explain**, discuss, and compare different binary digital modulation techniques.

**CO4**. **Distinguish** different types of noise and explain the effects of noise on communication system.

**CO5**. **Use** the basic concepts of information theory.

**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 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 | - |
| **CO2** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - | 2 | - |
| **CO3** | 1 | 1 | - | - | - | - | - | - | - | - | - | - | 1 | - |
| **CO4** | 1 | 1 | - | - | - | - | - | - | - | - | - | - | 2 | - |
| **CO5** | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 1 | - |
| **Average** | **2.0** | **2.0** | **1.0** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **1.0** | **1.2** | **-** |

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

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | **B. Tech ECM III Year-I Sem** | | | |
|---|---|---|---|---|---|
| Course Code: L31OF | **FUNDAMENTALS OF DIGITAL LOGIC DESIGN** (Open Elective -I) | L | T | P | D |
| Credits: **3** | | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Basics of Boolean algebra

**Course Objectives:**

Students will learn to

1. Understand basic tools for the design of digital circuits and fundamental concepts used in the design of digital systems.

2. Understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.

3. Implement simple logical operations using combinational logic circuits.

4. Design combinational logic circuits, sequential logic circuits.

5. Impart the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.

**Module 1:**

**Unit 1: Binary Systems:**

Digital systems, binary numbers, number base conversions, octal and hexadecimal numbers, complements, signed binary numbers, binary codes, binary storage and registers, binary logic.

**Module 2:**

**Unit-I: Boolean Algebra And Logic Gates**

Basic definitions, axiomatic definition of boolean algebra, basic theorems and properties of boolean algebra, boolean functions canonical and standard forms, other logic operations, digital logic gages, integrated circuits.

**Module 3:**

**Unit-I: Gate – Level Minimization**

The map method, four-variable map, five-variable map, product of sums simplification don't-care conditions, nand and nor implementation other two-level implementnations, exclusive – or function, hardward description language (hdl).

**Module 4:**

**Unit-I: Combinational Logic**

Combinational circuits, analysis procedure design procedure, binary adder-subtractor decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers, hdl for combinational circuits.

**Module 5:**

**Unit-I:**

Registers, shift registers, ripple counters synchronous counters, other counters, hdl for registers and counters.

**Text Books**

1. Digital design – third edition ,m.morrismano, pearson education/phi.
2. Fundamentals of logic design, roth, 5th edition,thomson.

**Reference Books**

1. Switching and finite automata theory by zvi. Kohavi, tatamcgraw hill.

2. Switching and logic design, c.v.s. rao, pearson education
3. Digital principles and design – donaldd.givone, tatamcgraw hill, edition.
4. Fundamentals of digital logic & micro computer design , 5th edition, m. Rafiquzzaman john wiley

## E-Resources

1. https://nptel.ac.in/courses/106/105/106105185/
2. https://www.coursera.org/learn/digital-systems

## Course Outcomes

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

**CO1**. Manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, gray, and BCD.

**CO2**. Build Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.

**CO3**. Design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.

**CO4**. Analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.

**CO5**. Construct digital systems by Algorithmic State Machine Charts

## CO-PO/PSO Mapping

| Course Outcomes | Program Outcomes(POs)/Program Specific Outcomes(PSOs) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 |
| **CO1** | 3 | 2 | 1 | - | - | - | - | - | - | - | - | 2 | 2 | - |
| **CO2** | 3 | 2 | - | - | 1 | - | - | - | - | - | - | 2 | 1 | 2 |
| **CO3** | 3 | - | 2 | 2 | 1 | - | - | - | - | - | - | - | 2 | 2 |
| **CO4** | 3 | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | 2 | - |
| **CO5** | 2 | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | 2 |
| **Average** | 2.4 | 2 | 1.75 | 1.67 | 1 | - | - | - | - | - | - | - | 1.75 | 2 |

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

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | B. Tech: EEE III Year-I Sem | | | |
|---|---|---|---|---|---|
| Course Code: **L31OG** | **Energy Engineering** **(OPEN ELECTIVE-I)** | L | T | P | D |
| Credits: 3 | | **3** | **0** | **0** | **0** |

### MODULE-I: Fundamentals of Energy: [10L]

Energy consumption and standard of living, Classification of energy resources, Consumption trend of primary energy resources, importance and salient features of conventional energy sources and non- conventional energy sources, Energy scenario in India.

### MODULE-II: Energy Sources-I: :( Elementary Aspects) [10L]

Coal fired steam thermal power plant – layout, working, Gas turbine power plant, Nuclear power plants, Hydro Electric plants.

### MODULE-III: Energy Sources-II :( Elementary Aspects):        [10L]

Solar energy, OTEC, Wind power plants, Tidal power plants and geothermal resources, Biomass, Fuel cell.

### MODULE-IV: Environmental Pollution and Control:   [10L]

Overview of Environmental Concepts: Global Warming - Ozone Layer & UV Radiations - Deforestation Pollution Control: Air Pollution, Solid Waste, Water Pollution, Influence of pollution regionally and globally.

### MODULE-V: Energy Conservation And Management: [10L]

Principle of energy conservation, electrical energy conservation opportunities, Definition and Objectives of Energy Management, Energy Management System, Top management support, Energy policy purpose, Roles and responsibilities of energy manager.

### Text Books

1. S.Rao and Dr.B.B.Parulekar, "Energy Technology", Khanna pub., Third edition, 1999.
2. Non-conventional energy resources by B.H.Khan, TMH, 2006.
3. Desai,AV, "Energy Demand: Analysis, Management and Conservation", Wiley Eastern Limited,1990.

### Reference Books

1. Management of Energy Environment Systems, W.K.Foell, John Wiley and Sons.
2. Environmental Impact Analysis Handbook, J.G.Rau, D.C.Wood, Mc Graw Hill.
3. Energy & Environment, J.M. Fowler, Mc Graw Hill.
4. Power Plant Engineering, P.K.Nag / Tata McGraw Hill.
5. G.D.Rai, "Non-conventional energy sources", Khanna pub. Fourth Edition, 2002.
6. Energy Management Handbook, John Wiley & Sons, Wayne C.Turner.

### E-Resources

1. http://nptel.ac.in/courses/112105051/
2. https://www.youtube.com/watch?v=Ota2_LUuar0
3. https://www.youtube.com/watch?v=3dJAtHaSQ98
4. https://www.youtube.com/watch?v=xokHLFE96h8
5. http://www.tatapower.com/businesses/renewable-energy.aspx

6. http://www.cleanlineenergy.com/technology/wind-and-solar

## Course Outcomes

The students will be able to:

**CO 1.** Collect and organize information on renewable energy technologies as a basis for further analysis

**CO 2.** Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the impact on the environment.

**CO 3.** List and describe the primary renewable energy resources and technologies.

**CO 4.** Understand effect of using these sources on the environment and climate.

**CO 5.** To quantify energy demands and make comparisons among energy uses, resources, and technologies

## 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 | PS O1 | PSO 2 |
| CO1 | - | - | 2 | - | - | 3 | 2 | 3 | - | - | - | - | - | 2 |
| CO2 | - | - | 3 | - | - | 2 | 3 | 2 | - | - | - | - | - | 3 |
| CO3 | - | - | 3 | - | - | 3 | 3 | 3 | - | - | - | - | - | 2 |
| CO4 | - | - | 3 | - | - | 3 | 3 | 2 | - | - | - | - | - | 3 |
| CO5 | - | - | 3 | - | - | 2 | 3 | 3 | - | - | - | - | - | 2 |
| Average | - | - | 2.8 | - | - | 2.6 | 2.8 | 2.6 | - | - | - | - | - | 2.4 |

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

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | | **B. Tech:IT** **III Year - I Sem** | | | |
|---|---|---|---|---|---|---|
| Course Code: **L31OH** | (Open Elective-I) | | L | T | P | D |
| Credits: **3** | **Open Source Software's** | | **3** | **0** | **0** | **0** |

**Unit I introduction to Open-Source**:

Open Source, Need and Principles of OSS, Open-Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Free Software Vs. Open-Source Software, Public Domain. History of free software, Proprietary Vs Open-Source Licensing Model, use of Open- Source Software, FOSS does not mean no cost. History: BSD, The Free Software Foundation and the GNU Project.

**Unit II Open-Source Principles and Methodology**:

Open-Source History, Open- Source Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open-Source Software Development, Licenses, Copyright vs. Copy left, Patents, Zero marginal cost, Income-generation Opportunities, Internationalization.

**Unit III Understanding Open-Source Ecosystem**:

Open-Source Operating Systems: GNU/Linux, Android, Free BSD, Open Solaris. Open-Source Hardware, Virtualization Technologies, Containerization Technologies: Docker, Development tools, IDEs, Debuggers, Programming languages, LAMP, Open-Source Database technologies.

**Unit IV Open-Source Ethics and Social Impact:**

Open source vs. closed source, Open-source Government, Ethics of Open-source, Social and Financial impacts of open-source technology, shared software, Shared source, Open Source as a Business Strategy

**Unit V Case Studies**:

Example Projects-Mozilla (Firefox), Wikipedia, GitHub, Open Office, LibreOffice.
**Course Outcomes**:
 **CO 1**: Differentiate between Open Source and Proprietary software and Licensing.
 **CO 2**: Recognize the applications, benefits and features of Open-Source Technologies
 **CO 3**: Gain knowledge to start, manage open-source projects

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | | | B. Tech: ME III Year - I Sem | |
|---|---|---|---|---|---|
| Course Code: **L31OI** | **AUTOMOTIVE TECHNOLOGY** (Open Elective-I) | L | T | P | D |
| Credits: **3** | | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Engineering Physics.

**Module 1:**

**Unit-1: Structural Systems of Automobile**– C hassis and B ody, Power unit, Transmission System, Rear wheel drive, Front wheel drive, 4-wheel drive.

**Unit-2: Other systems of Automobile**- Ignition systems, Fuel System, Cooling System, Electrical System.

**Module 2:**

**Unit-1: Fuels**: Types of Fuels – Gasoline fuels, CNG, Biofuels, Hydrogen as a fuel for IC Engines, advantages and limitations.

**Unit-2: Steering, Suspension and Braking Systems:** Terminology in Steering geometry, Ackerman steering mechanism, Davis steering mechanism, steering linkages. Objects of suspension systems – Rigid axle suspension system. Mechanical brake system, Hydraulic brake system –Requirement of brake fluid. Pneumatic and Vacuum brakes.

**Module 3:**

**Unit-1: Fuel Cell and Solar Vehicles**: Fuel cell vehicle – Operating principle, types of fuel cells, fuel cell options for fuel cell vehicle and fuel cell hybrid vehicle. Solar vehicle - Solar photovoltaic cell, solar array, solar car electrical system and drive train.

**Unit-2: Electric and Hybrid Vehicles:** Electric vehicles - Layout of an electric vehicle, performance, energy consumption, advantage and limitations. Hybrid electric vehicles - Concepts, types of hybrid drive train architecture, merits and demerits.

**Module 4:**

**Unit-1: Telematics Systems**: Global positioning system, geographical information systems, navigation system.

**Unit-2: Comfort Systems**: Automotive vision system, active suspension system, power steering and power windows.

**Module 5:**

**Unit-1: Safety Systems**: Active and passive safety, airbags, seat belt tightening system, collision warning systems, anti-lock braking systems, traction control system.

**Unit-2: Emission and noise control regulations**- Pollution standards, National and international – Pollution Control – Techniques – Noise Pollution & control.

**Text Books**

1. William B Riddens, "Understanding Automotive Electronics", 5th edition, Butter worth Heinemann Woburn, 1998.
2. Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay and Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2005.
3. Kripal Singh, "Automobile Engineering", Standard Publishers, Vol. 1 & 2, 2007

**Reference Books**

1. Automotive Hand Book" Robert Bosch, SAE, 5th edition, 2000.
2. Ljubo Vlacic, Michel Parent and Fumio Harashima, "Intelligent Vehicle Technologies", Butterworth-Heinemann publications, Oxford, 2001.

3. Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
4. "Navigation and Intelligent Transportation Systems – Progress in Technology", Ronald K Jurgen, Automotive Electronics Series, SAE, USA, 1998.

**E-Resources**

1. https://rb.gy/zm8le8
2. https://rb.gy/ceck4k
3. https://nptel.ac.in/courses/107/106/107106088/
4. https://nptel.ac.in/courses/108/102/108102121/

**Course Outcomes**

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

**CO1:** Outline the overview of automobile engineering

**CO2:** Identify the different fuels and control systems

**CO3:** Develop the concepts and drive train configurations of electric and hybrid-electric vehicles

**CO4:** Apply the use of intelligent vehicle technologies like navigation in automobiles

**CO5:** Aware of safety, security and regulations

**CO-PO/PSO Mapping**

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

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

**Pre-Requisites:** Nil

**Course Objectives**

This course will enable students to:

1. To introduce about distribution of mineral deposits in India
2. To acquaint with different stages of mining process
3. To get idea about Drilling and its machinery
4. To get idea about Explosives and blasting in mines
5. To know about shaft sinking methods, precaution & lining during shaft sinking

**Module 1**

**Introduction**: Distribution of mineral deposits in India and other countries, mining contributions to civilization, mining terminology.

**Module 2**

**Stages in the life of the mine** - prospecting, exploration, development, exploitation, and reclamation. Access to mineral deposit- selection, location, size, and shape (incline, shaft and Adit), brief overview of underground and surface mining methods.

**Module 3**

**Drilling**: Types of drills, drilling methods, electric, pneumatic, and hydraulic drills, drill steels and bits, drilling rigs, and jumbos.

**Module 4**

**Explosives**: Classification, composition, properties and tests, fuses, detonators, blasting devices and accessories, substitutes for explosives, handling and storage, transportation of explosives.; Rock blasting: Mechanism of rock blasting, blasting procedure, and pattern of shot holes.

**Module 5**

**Shaft sinking**: Ordinary and special methods, problems, and precautions, shaft supports and lining.

**Textbooks**

1. R. P. Pal, Rock blasting effect and operation, A. A. Balkema, 1st Ed, 2005.
2. D. J. Deshmukh, Elements of mining technology, Vol. 1, Central techno, 7th Ed, 2001.

**Reference Books**

1. C. P. Chugh, Drilling technology handbook, Oxford and IBH, 1st Ed, 1977.
2. R. D. Singh, Principles and practices of modern coal mining, New age international, 1st Ed, 1997.

**Course Outcomes**

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

**CO1:** Learn about distribution of mineral deposits in India

**CO2:** Learn about stages on mining process

**CO3:** Learn about drilling and its machinery

**CO4:** Understand about explosives, blasting and blasting mechanism

**CO5:** Understand about shaft sinking methods, precautions, and lining of shafts

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | | **B. Tech III Year-I Sem** | | |
|---|---|---|---|---|---|
| Course Code: **L31OK** | Open Elective-I **Entrepreneurship for Micro, Small and Medium Enterprises** | | L | T | P | D |
| Credits: **3** | | | **3** | **0** | **0** | **0** |

**Course Objective:**

To understand the setting up and management of MSMEs and initiatives of Government and other institutions support for growth and development of MSMEs.

**UNIT-I:**

**Introduction for Small and Medium Entrepreneurship (SME):** Concept & Definition, Role of Business in the modern Indian Economy SMEs in India, Employment and export opportunities in MSMEs. Issues and challenges of MSMEs

**UNIT-II:**

**Setting of SMEs':** Identifying the Business opportunity, Business opportunities in various sectors, formalities for setting up an enterprise - Location of Enterprise – steps in setting up an enterprise – Environmental aspects in setting up, Incentives and subsidies, Rural entrepreneurship – Women entrepreneurship.

**UNIT-III:**

**Institutions supporting MSMEs:** –Forms of Financial support, Long term and Short term financial support, Sources of Financial support, Development Financial Institutions, Investment Institutions, Central level institutions, State level institutions, Other agencies, Commercial Bank – Appraisal of Bank for loans. Institutional aids for entrepreneurship development – Role of DST, SIDCO, NSIC, IRCI, NIDC, SIDBI, SISI, SIPCOT, Entrepreneurial guidance bureaus

**UNIT-IV:**

**Management of MSME:** Management of Product Line; Communication with clients - Credit Monitoring System - Management of NPAs - Restructuring, Revival and Rehabilitation of MSME, Problems of entrepreneurs – sickness in SMI – Reasons and remedies — Evaluating entrepreneurialperformance.

**UNIT-V:**

**Role of Government in promoting Entrepreneurship:** MSME policy in India, Agencies for Policy Formulation and Implementation: District Industries Centers (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB).

**Course Outcomes:** Students will be able to understand

a) Issues and Challenges in MSMEs

b) Setting up of MSMEs

c) Management of MSMEs

d) Institution and Government support.

**Suggested Readings:**

1. Vasant Desai, Small Scale Industries and Entrepreneurship, Himalaya Publishing House, 2003.
2. Poornima M Charanthimath, Entrepreneurship Development Small Business Enterprises,

Pearson, 2006.

3. Paul Burns & Jim Dew Hunt, Small Business Entrepreneurship, Palgrave Macmillan publishers, 2010.

4. Suman Kalyan Chaudhury, Micro Small and Medium Enterprises in India Hardcover, Raj Publications, 2013.

5. Aneet Monika Agarwal, Small and medium enterprises in transitional economies", challenges and opportunities, DEEP and DEEP Publications.

**Pre-Requisites:**

### Module –I Solution of Equations and Eigen value Problems    [ 10L ]

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Matrix Inversion by Gauss Jordan method - Eigen values of a matrix by Power method.

### Module 2: Interpolation and Approximation   [9L]

Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae.

### Module 3: Numerical Differentiation and Integration     [10L]

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's method - Two point and three point Gaussian quadrature formulae Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

### Module 4: Initial Value Problems for Ordinary Differential Equations[10L]

Single Step methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order equations - Multi step methods - Milne's and AdamsBash forth predictor corrector methods for solving first order equations**.**

### Module5: Boundary Value Problems in Ordinary Differential Equations[9L]

Finite difference methods for solving two-point linear boundary value problems - Finite difference techniques for the solution of two-dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method**.**

### Text Books

4.  B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2015
5.  Chapra. S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill,   5 th Edition, New Delhi, 2007.

### Reference Books

**1.**  R.K.Jain & S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2015.
2.  Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11thReprint, 2010.

### E-Resources

1.  http://www.brainkart.com/article/Solution-of-Equations-and-Eigenvalue-Problems_6462/
2.  http://www.cs.nthu.edu.tw/~cchen/CS3331/ch6.pdf
3.  http://www.vbspu.ac.in/wp-content/uploads/2016/02/Differentiation-and-Integration.pdf
4.  https://link.springer.com/chapter/10.1007/978-1-4612-6390-6_4
5.  https://www.youtube.com/watch?v=ZaaeInBsRfo

### Course Outcomes

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

**CO1**. Understand the basic knowledge on solution of Eigen values

**CO2**. Use interpolation and approximation to solve engineering problems.

**CO3**. Discuss the numerical differentiation and integration.

**CO4**. Apply initial value problems for solving first order differential equation.

**CO5**. Apply the boundary value problems in ordinary and partial differential equations

## 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 | 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 III Year- I Sem** | | | |
|---|---|---|---|---|---|
| Course Code: L31OM | **NANOMATERIALS** **(Open Elective-I)** | L | T | P | D |
| Credits: **3** | **(COMMON TO: All branches)** | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Fundamentals of Physics.

**Module -1: Introduction to Nanomaterials    [9L]**

Introduction to nanotechnology and materials, Nano materials, Introduction to nano sizes and properties comparison with the bulk materials, Different Shapes and Sizes and Morphology. Classification of nanomaterials. Fullerene, carbon, Nanotubes (CNT's), Nanoparticles. Physical, Chemical, Electrical, Optical, Magnetic and mechanical properties of nanomaterials.

**Module -2:  Physical and Chemical methods [9L]**

**Physical Methods**:

Bottom-up approach and Top-down approach, Inert gas condensation, Arc Discharge, lasers ablation, laser pyrolysis, ball milling, and electro deposition.

 **Chemical Methods:** Nanocrystals by chemical reduction, photochemical synthesis, electrochemical synthesis, Nano crystals of semiconductors.

**Module–3:  Synthesis of Nanomaterials    [9L]**

Thermolysis route – spray pyrolysis and solved metal atom dispersion, sol-gel method solvothermal and hydrothermal routes, solution combustion synthesis, CVD method, PVD method.

**Module–4: Properties of Nanomaterials  [9L]**

Quantum Structure: 3D-Pontential Wells (Spherical & Rectangular Parallelepiped), 2D (Circular & Square, Quantum Corrals), 1D (Quantum Wires), 0D (Quantum Dots).

**Module–5: X-RAY Characterization techniques   [9L]**

X-Ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-Ray Analysis (EDAX), Principles and applications of X-Ray Diffraction, Electron Diffraction, and Electron probe microanalysis(EPMA), SEM and TEM method.

**Text Books**

1.C N R Rao, A Muller and A K Cheetham "The chemistry of Nano materials: Synthesis, Properties and Applications" John Wiley, First Edition, 2004

2. Hari Singh Nalwa, "Nano structured Materials and Nanotechnology", Academic Press, First Edition, 2002.

**Reference Books**

1.Charles P Poole Jr "Introduction to Nanotechnology", John Willey & Sons, 1st Edition, 2003
2.C Dupas, P Houdy, M Lahmani, Nanoscience: "Nanotechnologies and Nano physics",  Springer-Verlag    Berlin Heidelberg, 1st Edition, 2007.

**E-Resources**

1. http://nptel.ac.in/courses/103103033/module9/lecture1.pdf
2.http://courses.washington.edu/overney/NME498_Material/NME498_Periods/Lect ure4-Overney-NP-Synthesis.pdf.
3. http://www.materialstoday.com/nanomaterials/journals/
4. https://www.journals.elsevier.com/nanoimpact
5. http://www.springer.com/materials/nanotechnology/journal/12274

## Course Outcomes

After completion of this course the student is able to
1. Understand the properties of Nano-structured materials.
2. Get the knowledge of different physical and chemical methods of synthesis of Nano materials.
3. Apply basic knowledge on the properties and applications of few nanomaterials.
4.Understand different thermal methods of synthesis of nano materials and to learn different surface characterization techniques.
5.Acquire the different compositional and structural characterization techniques.

**Pre-Requisites:** Nil

## Module 1: Phase Rule and alloys [8L]

Phase Rule: Definition of terms: Phase, component, degree of freedom, phase rule equation. Phase diagrams-one component system-water system. Two component system Lead-Silver, cooling curves, heat treatment based on iron-carbon phase diagram - hardening, annealing and normalization. Introduction to alloys-fabrication of alloys-ferrous alloys-nonferrous alloys-industrial applications.

## Module 2: Composites, Abrasives and Adhesives [10L]

Composites: Basics of composites, composition and characteristics-types of composites –particle and fiber reinforced composites and their applications. Abrasives- natural and artificial abrasives-grinding wheels-abrasive paper and cloth. Adhesives- classification -action of adhesives- factors influencing adhesive action development of adhesive strength.

## Module 3: Cement and Concrete:  [10L]

Introduction-Classification of cement-natural-chemical composition of cement-Portland cement-chemical reactions involved in setting and hardening of cement-additives for cement-mortars and concretes-pre stressed concrete-post tensioning-curing-overall scenario of cement industry-Reinforced concrete, constructions-testing and decaying of cement-prevention of cement decay.

## Module 4: Glass, Ceramics and Refractories:[9L]

Structure of glass-properties-Manufacturing of glass-Types of glasses-uses Ceramics-clays-methods for fabrication of ceramic ware plasticity of clays. Ceramic products-glazes. Porcelain and vitreous enamels. Requisites of a good refractory-classification, properties and applications of refractories.

## Module 5:  Colloids and surfactants[9L]

Introduction to solution-types of colloids-characteristics of lyophilic and lyophobic solutions-preparation of colloids (Dispersion methods & Aggregation methods)-purification of colloids (Dialysis, Electro dialysis and Ultrafiltration).Characteristics of colloidal solutions-coagulation of colloids-origin of charge on colloids-protective colloids-emulsions-gels-applications of colloids. Introduction to surfactants-classification of surfactants-CMC (critical micelle concentration)-HLB scale-detergents-cleaning action.

## Text Books

14. "A text Book of Engineering Chemistry", P.C.Jain and Monica Jain, Dhanpat Rai Publications, New Delhi, 12th Edition 2006.

15. "Text Book of Engineering chemistry", B.Rama Devi, Ch.VenkataRamana Reddy and PrasanthaRath, Cengage Learning India Pvt. Ltd, 2016.

16. **"**Colloids and Interfaces with Surfactants and Polymers", J. Goodwin, 2nd Edition 2009.

## Reference Books

1. "Principles of Physical Chemistry", B.R.Puri, L.R.Sharmaand M.S.Pathania, S.Nagin Chand &Co., New Delhi, 23rd Edition, 1993.

2. "Engineering Chemistry", M.ThirumalaChary and E.Laxminarayana, SciTech

publications(INDIA) PVT Ltd, Third Edition,2016

## E-Resources

1. https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/materials-science.html
2. https://www.sciencedirect.com/science/article/pii/S1369702110701875
3. https://engineering.purdue.edu/MSE/aboutus/whatsmaterials
4. https://www.engineergirl.org/32721/Difference-between-chemical-and-materials-engineering
5. https://www.webpages.uidaho.edu/catalog/2013/chemical-and-materials-engineering.htm

## Course Outcomes

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

1. Interpret the vitality of phase rule in metallurgy and application of phase rule to one and two component systems.
2. Understand the concepts of abrasives, adhesives and liquid.
3. Know the importance of basic constructional material, Portland cement in Civil Engineering works.
4. Acquire the knowledge about properties and applications of glass, ceramics and refractories.
5. Understand the relationships between macroscopic material properties and microscopic structures.

| AY 2022-23 onwards | J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous) | | B. Tech III Year – I Sem | | | |
|---|---|---|---|---|---|---|
| Course Code: **L31OO** | **TECHNICAL WRITING SKILLS (COMMON TO ALL)** | | **L** | **T** | **P** | **D** |
| **Credits: 3** | | | **3** | **0** | **0** | **0** |

**Pre-Requisites: Nil**

**Course Objectives:** To learn

1. Know the elements of effective writing
2. Understand the letter writing and resume writing
3. Classify the types and styles of report writing
4. Understand the proposal writings
5. Examine the research papers and research articles

**Module-I Elements of Effective Writing**

Introduction-Characteristics of Good Writing-words, phrases, sentences and developing effective paragraphs.

**Module -II Academic Writing**

Letter writing and Job Application: Introduction-types of letter writing-the seven C's of letter writing- significance- purpose-structure-layout-principles-planning a letter and cover letter.

Resume writing: Introduction-Resume design- parts of a Resume-Resume Styles and final tips.

**Module -III Technical Report Writing**

Introduction-importance of Reports-Objectives of Reports-Categories of Reports-Formats-prewriting-structures of reports-types of reports- short reports- long reports-research and writing the report-first draft-revising, editing, and proofreading.

**Module -IV Technical Proposals**

Introduction-definition and purpose-types-characteristics-structure of proposals-style and appearance-evaluation of proposals.

**Module -V Writing Research Papers and Articles**

Introduction-writing strategies-nature and significance-types of research papers and articles-journal articles-conference papers-review and research articles and elements of articles.

**References:**

1. Raman, Meenakshi and Sangeeta Sharma. Technical Communication-Principles and Practice. Third Edition, New Delhi: UP., 2015.
2. Rizvi, M Ashraf. Effective Technical-Communication. New Delhi: Tata McGraw-Hill., 2005.
3. Butterfield, Jeff. Soft Skills for Everyone. Delhi: Cenege., 2010.
4. Cooper, Donald R. Pamela S Schindler. Business Research Methods. New Delhi: Tata McGraw-Hill, 2006.

**Web Sources:**

**Course outcomes:** At the end of this course students will be able to

1. Use the characteristics of good writing like words, phrases, sentences and paragraphs.
2. Understand the role of letters and resumes getting jobs.
3. Utilize the report writing skills in business environment
4. Define the style, appearance, and evaluation of proposals.
5. Write the academic and research papers and articles

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 3 | .. | 3 | .. | .. |
| CO2 | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 3 | .. | 3 | .. | .. |
| CO3 | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 3 | .. | 3 | .. | .. |
| CO4 | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 3 | .. | 3 | .. | .. |
| CO5 | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 3 | .. | 3 | .. | .. |
| Total | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 3 | .. | 3 | .. | .. |

**CO-Articulation Matrix**
**CO-PO/PSO Mapping Chart**
**3/2/1 indicates the strength of the calculation**
**3-Strong, 2-Medium, 1-Low**

The above syllabus is approved

**Signature of the members:**

**Pre-Requisites: Nil**

## Module 1: Evolution of the Indian Constitution

1909 Act, 1919 Act end 1935 Act. Constituent Assemtily Composition and Functions Fundamentals features of the Indian Constitution.

## Module 2: Union Government

Executive: President. Prime Minister, Council of Minister

Executive: Governor, Chief Minister, Council of Minister

Local Government: Panchayat Raj Institutions, Urban Government.

## Module 3: Rights and Duties

Fundamental Rights. Directive principles. Fundamental Duties.

## Module 4: Relation between Federal and provincial units

Union State relations. Administrative, legislative and Financial. Inter State council. NITI Ayog Finance Commission of India

## Module 5: Statutory Institutions.

Elections-Election Commission of India, National Human Rights Commission National Commission for Women.

**Text Books:**

1 D.D. Basu, Introduction to the constitution of India. Lexis Nexis. Now Delhi

2. Subhash Kashyap, Our Parliament, National Book Trust. New Delhi.

**Reference Books:**

1. Peu Ghosh Indian Government & Polities. Prentice Hell of India, New Delhi

2 B.Z. Fadia & Kuldeep Fadia, Indian Government & Polices, LexisNexis. New Delhi

**Course Outcomes:**

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

COI: Know the background of the present constitution of India.

CO2: Understand the working of the union, state and local levels.

CO3. Gain consciousness on the fundamental rights and duties

CO4. Be able to understand the functioning and distribution of financial resources between center and states.

Be exposed to the realty of hierarchical Indian social structure and the way the grievances the deprived sections can be addressed to raise human dignity in a democratic way

# OPEN ELECTIVE-II

**Pre-Requisites:** Construction Technology and Project Management, Estimation and Costing.

## Module 1: Unit-I: Concept of a Project

Characteristic features – Project Life cycle – Phases – Project Management – tools and techniquesfor project management – role of project managers.

## Module 2: Unit-I: Project management plan and objectives

Programming – scheduling – project organization – organization and project team – role ofcommunication in project management – controlling systems.

## Module 3: Unit-I:Safety Management Function

Importance of safety in construction industry, Line versus staff authority, Safety responsibility and accountability in construction industry, Safety organizations, Role of various parties, duties, responsibilities of top management, site managers, supervisors etc., Role of safety officers, Responsibilities of general employees, Safety administration.

## Module 4: Unit-I:  Types of contract documents

Essentials of contract agreement – legal aspects, penal provisions on breach of contract. Definition of the terms  – Tender, earnest money deposit, security deposit, tender forms, documents, and types. Acceptance of contract documents. Termination of contract, completion certificate, quality control, right of contractor, refund of deposit. Administrative approval – Technical sanction. Nominal muster roll, measurement books – procedure for recording and checking measurements – preparation of bills.

## Module 5: Unit-I:Valuation

Types of value, purposes of valuation factors affecting value. Different methods of valuation for

different types of assets such as land and building, horticulture, historical places. Valuation Report,contents, standard formats, Case study of any one Report.

**Text Books**

1. "Construction Technology" by Subira K. Sarkar, Subhajit Saraswathi / Oxford UniversityPress, 3rd edition, Apr 2009.
2. "Project management- strategic Financial Planning, Evaluation and Control" by B M Patel,Vikas Publishing House Pvt. Ltd. New Delhi, 2nd edition oct 2000.

**Reference Books**

1. "Total Construction Project Management" by George J.Ritz , McGraw-Hill Inc, 2nd editionJan 2013.
2. "Construction Project Management Planning, Scheduling and Control" by K K Chitkara

## E-Resources

1. https://nptel.ac.in/courses/105/103/105103093/
2. https://nptel.ac.in/courses/105/103/105103023/

## Course Outcomes

At the end of the course, the student will be able to:
1. **Describe** the different approaches for successful handling of the project
2. **Apply** different plans and schedules for the development of the project.
3. **Describe** the importance of safety management in construction industry.
4. **List** out the different tenders and contract document for a construction project.
5. **Evaluate** the different types of reports for different construction projects

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 2 | 1 | - | - | 2 | 1 | - | - | 2 | - | 3 | 1 | 1 | - |
| CO2 | 2 | 1 | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 | - |
| CO3 | 2 | 1 | - | - | - | 3 | - | - | - | - | - | 1 | 1 | - |
| CO4 | 2 | 1 | - | - | - | 2 | - | - | - | - | 3 | - | 1 | - |
| CO5 | 2 | 2 | - | - | - | - | - | - | - | - | 2 | - | 1 | - |
| Average | 2 | 1.4 | 0.4 | - | 0.4 | 1.2 | - | - | 0.4 | - | 2 | 0.8 | 1.4 | - |

*CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak*

| AY: 2022-23 Onwards | J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY (UGC Autonomous) | B. Tech-CSE III Year- II Sem | | | |
|---|---|---|---|---|---|
| Course Code: **L32OB** | **Principles of Operating Systems (Open Elective -II)** | L | T | P | D |
| Credits: **3** | | **3** | **0** | **0** | **0** |

**Pre-Requisites:**

Knowledge on Programming for Problem Solving

**Course Objectives:**

The students should be able to

1. Understand the basic concepts and functions of computer operating systems.
2. Apply the concurrency control among the operating system programs execution.
3. Demonstrate the techniques used to manage the memory during program execution.
4. Explain the various storage management methods and functions of operating systems.
5. Design the security features against attacks on computer system.

**Module 1:**

*Overview:* Basic Elements, Evolution of the Microprocessor, Instruction Execution, Interrupts, Cache Memory, Direct Access Memory.

*System Structures:* Computer Systems Organization, Computer System Architecture, Operating System Architecture, Systems Calls, Operating System structure, Building and Booting an Operating System.

**Module 2:**

*Process Concepts:* Introduction, Process Scheduling, Scheduling Criteria, Scheduling Algorithms, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Mutex Locks, Semaphores, Monitors, Classic Problems of Synchronization.

*Deadlock:* Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

**Module 3:**

*Main Memory:* Background, Contiguous Memory Allocation, Paging, Page-Table Structure, Swapping, Segmentation.

*Virtual Memory:* Background, Demand Paging, Page Replacement Algorithms, Frames Allocation, Thrashing.

**Module 4:**

*Mass-Storage Structure:* Overview, Disk Structure, Disk Attachment, Disk Scheduling, Swap-Space Management, RAID Structure.

*File system Management:* File Concepts, File System Structure, File System Operations, Directory Implementation, Allocation Methods, Free-Space Management.

**Module 5:**

*Security Threats:* Computer security concepts, Threats, Attacks and Assets, Intruders, Malicious software, Viruses, Worms, Bots, Rootkits.

*Security Techniques:* Authentication, Access Control, Intrusion Detection, Malware Defense, Dealing with Buffer Overflow attacks.

**Textbooks**

1. Operating System Concepts-A. Silberschatz, Peter B. Galvin, Greg Gagne, 10th Edition, John Wiley& Sons inc.
2. Operating Systems Internals and Design Principles – William Stallings, 7th Edition, Prentice Hall.

**Reference Books**

1. Principles of Operating Systems-Naresh Chauhan, Oxford Higher Education.
2. Operating System A Design Approach-Crowley, TMH.
**3.** Modern Operating Systems-Andrew S Tanenbaum, 2nd Edition Pearson, PHI.

### E - Resources:

1. https://lecturenotes.in/subject/2234/Computer_Network
2. http://nptel.ac.in/courses/106102234/
3. https://www.iitg.ernet.in/dgoswami/CN-Notes.pdf
4. http://www.coursera.org/
5. http://ocw.mit.edu/index.htm.

**Course Outcomes**

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

**CO1:** Identify the different structures and functions of operating systems and it's components.

**CO2:** Apply different algorithms and methods to achieve concurrency among the operating system programs.

**CO3:** Analyse the memory management techniques used in the execution of operating system programs.

**CO4:** Implement the suitable methods to improve the efficiency of storage management devices.

**CO5:** Apply suitable algorithms to ensure the security of computer system.

**Pre-Requisites:**

Data mining, Machine Learning

**Course objectives:**

**The student will:**

1. Know the basics of predictive analytics and summarize Data, Categorize Models, and techniques
2. Know about the Decision tree, Support Vector Machine for Data Classification
3. Describe Methods such as Naïve Bayes Markov Model, Linear Regression, Neural Networks to Boost Prediction Accuracy for Data Classification.
4. Study the predictive models for various Real-Time Applications.
5. Study the Analysis and Visualized predictive Model's results using Data Visualization tools.

**Module 1:**

**INTRODUCTION TO PREDICTIVE ANLAYTICS**

Introduction – Predictive Analytics in the Wild – Exploring Data types and associated Techniques - Complexities of data - Applying Models: Models and simulation, Categorizing Models, Describing, summarizing data, and decisions – Identify similarities in Data: Data Clustering, converting Raw Data into a Matrix, Identify K-groups in Data.

**Module 2:**

**DATA CLASSIFICATION – PART I**

Background – Exploring Data classification process - Using Data Classification to predict the future: Decision tree, Algorithm for generating Decision Trees, Support Vector Machine.

**Module 3:**

**DATA CLASSIFICATION – PART II**

Ensemble Methods to Boost Prediction Accuracy: Naïve Bayes Classification Algorithm, The Markov Model, Linear Regression, Neural Networks – Deep learning.

**Module 4:**

**DATA PREPARATION AND MODELLING**

Adopt predictive analytics - Processing data: identifying, cleaning, generating, reducing dimensionality of data – Structuring Data – Build predictive model: develop and test the model.

**Module 5:**

**FORECASTING AND TIME SERIES ANALYSIS**

Forecasting- Time Series Analysis-Additive & Multiplicative models- Exponential smoothing techniques - Forecasting Accuracy - Auto-regressive and moving average models.

**Text Books:**

1. Anasse Bari, Mohamed Chaouchi, Tommy Jung, "Predictive Analytics For Dummies", Wiley Publisher, 2nd Edition, 2016.

**Reference Books:**

1. Bertt Lantz, Machine Learning with R: Expert techniques for predictive modeling to solve all your data analysis problems, Pack Publisher, 2nd Edition, 2015.
2. Aurelien,"Hands-On Machine Learning with Scikit-Learn & TensorFlow", O'Reilly Publisher, 5th Edition, 2017.
3. Max Kuhn, Kjell Johnson, " Applied Predictive Modeling" Springer, 2013.

**E - Resources:**

1. https://vuquangnguyen2016.files.wordpress.com/2018/03/applied-predictive-modeling-max-kuhn-kjell-johnson_1518.pdf

2. https://www.researchgate.net/publication/329873035_Prediction_Modeling_Methodology
3. https://www.coursera.org/learn/predictive-modeling-analytics
4. https://www.edx.org/course/predictive-analytics

**Course Outcomes:**

**The student will be able to:**

1. Identify the basics of predictive analytics and summarize Data, Categorize Models, and techniques
2. Apply Decision tree, Support Vector Machine for Data Classification
3. Apply Methods such as Naïve Bayes Markov Model, Linear Regression, Neural Networks to Boost Prediction Accuracy for Data Classification.
4. Construct predictive models for various Real-Time Applications.
5. Analyze and Visualize predictive Model's results using Data Visualization tools

## Course Objective:

This course enables the students to have a formal introduction to Business Analytics and Fundamentals of R Programming

**MODULE 1**: **Introduction Business Analytics**

### Unit 1:

Introduction to Business Analytics -Competing on Analytics - The New Science of Winning Business Analytics.

### Unit 2:

Introduction to Market, Trends and People- The Paradigm Shift from Data to Insight and from Business.

## MODULE 2: Intelligence to Business Analytics

### Unit 1:

Intelligence to Business Analytics- Descriptive, Predictive and Prescriptive Analytics - Introduction to R programs-Running R programs.

### Unit 2:

Mastering Fundamental R concepts -How to diagnose and correct syntax errors-

## MODULE 3: Data Sets &Variables

### Unit 1:

Getting familiar with R data sets- Creating R data sets- Reading data files into R - Excel, .txt, SPSS, SAS.

### Unit 2:

Html-Assigning variable attributes Changing variable attributes,

## MODULE 4: Data Visualization

**Unit 1:** Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques. Icon-Based Visualization Techniques, Hierarchical Visualization Techniques.
**Unit 2:** Visualizing Complex Data and Relations, Charts, Plots, Maps, Diagrams and Matrices

## MODULE 5: Visualization Patterns Unit 1:

Visualize Patterns over Time- Visualizing Relationship- Spotting Differences- Visualizing Spatial Relationships.

### Unit 2:

Data Visualization Using R, Tools, Ggplot2, Bar chart, Pie Chart, Tableau, Plotly, Histogram, Box Plot, Scatter Plot, Heat Map.

**Text Books**

1. Essentials of Business Analytics: Camm, Cochran, others, Cengage Learning,2016
2. R for Dummies: Andrie De Varies and Joris Mays: Wiley,2016
3. Introductory Statistics with R: Peter Dalgaard.

### Course Outcomes:

1. Identify the source of a quantifiable problem, recognize the issues involved and produce an appropriate action plan.
2. Translate a problem into a statistical model
3. Gather Data and Employ R Programming software to fit model to data and solve problem
4. Calculate and interpret numerous statistical values and appreciate their value to the business Manager

**Pre-Requisites: NIL**

**Module 1: INTRODUCTION TO IC TECHNOLOGIES [10L]**

**Unit-I: [6L]**

Fabrication steps for BJT Transistor, Fabrication steps for MOSFET Transistor, Comparison between BJT and MOSFET fabrication.

**Unit-II: [4L]**

Semiconductor Substrate-Crystal defects, Electronic Grade Silicon, Czochralski Growth, Float Zone Growth

**Module 2: Wafer Preparation & Epitaxy [9L]**

**Unit-I: [5L]**

Wafer Preparation-Silicon Shaping, Etching and Polishing, Chemical cleaning.

**Unit-II: [4L]**

Epitaxy. Defects in Epitaxial growth, Liquid phase Epitaxy, Vapor Phase Epitaxy and Molecular Beam Epitaxy.

**Module 3: Oxidation and Diffusion [8L]**

**Unit-I: [4L]**

Oxidation and Kinetics of oxide growth, Deal-Grove Model of oxidation, Linear, and Parabolic Rate coefficient.

**Unit-II: [4L]**

Diffusuion- Ficks First law and Second law of Diffusion.

**Module 4: Ion Implantation and Chemical Vapour Deposition [10L]**

**Unit-I: [5L]**

Diffusion Vs Ion Implantation, Ion Implantation system

**Unit-II: [5L]**

CVD for deposition of dielectric and polysilicon- a simple CVD system, Chemical equilibrium and the law of mass action

**Module 5: Pattern Transfer and Etching[9L]**

**Unit-I: [5L]**

Lithography and types. Step by step process of Photo Lithography, photo resist, Figures of Merit.

**Unit-II: [5L]**

Wet etching, Plasma etching, Reaction ion etching.

**Text Books**

1. S.M. SZE "VLSI Technology" 2nd edition
2. Plummer Deal griffin, "Silicon VLSI Technology" Pearson Publication

**Reference Books**
1. VLSI Design by Sujata Pandey.
2. J. Bhasker "VHDL for Beginner" Pearson

**E-Resources**
6. NPTEL-VLSI Design by Dr. Nandita Das Gupta, IIT Madras

**Course Outcomes**

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

**CO1**. Familiarize with IC fabrication steps.

**CO2**. Examine Wafer Preparation and Epitaxies.

**CO3**. Analyse oxidation and Diffusion Techniques.

**CO4**. Explain Ion Implantation and Chemical Vapour Deposition

**CO5**. Assess Photolithography and Etching process.

**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 | | - | - | - | - | - | - | - | - | - | 3 | - |
| **CO2** | 3 | 2 | | - | - | - | - | - | - | - | - | - | 3 | - |
| **CO3** | 3 | 1 | | - | - | - | - | - | - | - | - | - | 3 | - |
| **CO4** | 3 | 3 | | - | - | - | - | - | - | - | - | - | 3 | - |
| **CO5** | 3 | 2 | | - | - | - | - | - | - | - | - | - | 3 | - |
| **Average** | **3** | **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 ECM III Year-II Sem** | | | |
| --- | --- | --- | --- | --- | --- | --- |
| Course Code: L32OF | **INTRODUCTION TO MICROPROCESSORS AND MICRO CONTROLLERS** (Open Elective -II) | | L | T | P | D |
| Credits: **3** | | | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Basic of ICs

**Course Objectives:**

Students will learn to:

1. Study the Architecture of 8085&8086 microprocessor

2. Learn the design aspects of I/O and Memory Interfacing circuits.

3. Study the Architecture of 8051 microcontroller

## Module 1

### Unit-I: 8086 Introduction

8086 Architecture Functional diagrams, Register organization, memory segmentation, programming model, memory addresses, physical memory organization

### Unit-II: 8086 Architecture

Architecture of 8086, signal descriptions of 8086-common function signals, Timing diagrams, interrupts of 8086.

## Module 2

### Unit-I: Instruction set of 8086

Instruction formats, addressing modes, instruction set, assembler directives, macros.

### Unit-II: Assembly language programming of 8086

Simple programs involving logical, branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations.

## Module 3

### Unit-I: I/O Interface

8255 PPI, Various modes of operation and interfacing to 8086, interfacing keyboard, Display, D/A and A/D converter.

### Unit-II: Interfacing with advanced devices

Memory Interfacing to 8086, Interrupt Structure of 8086, Vector Interrupt Table, Interrupt Service Routine.

## Module 4

### Unit-I: Introduction to Microcontrollers

Overview of 8051 microcontrollers, architecture, I/O ports, memory organization.

### Unit-II: Addressing Modes

Addressing modes and instruction set of 8051, simple programs.

## Module 5:

### Unit-I: 8051 Real Time control 1

Programming Time Interrupts, Programming External Hardware Interrupts.

### Unit-II: 8051 Real Time control 2

Programming the serial communication interrupts, programming 8051 Timers and counters

## Text Books

1. D.V.Hall, Microprocessors and interfacing, TMGH,2nd Edition 2006.

2. Kenneth.J.Ayala, The8051Microcontroler,3rdEd., C engage Learning

## Reference Books

1. Advanced Microprocessors and peripherals-A.K.Ray and K.M Bhurchandani, TMH,2 nd Edition 2006.
2. The 8051 Microcontrollers. Architecture and programming and applications- K.Uma Rao, Andhe Pallavi, Pearson, 2009.
3. Micro computer system 8086/8088 family architecture. Programming and design-Du and GA Gibson, PHI 2nd Edition.

**E-Resources**

1. https://nptel.ac.in/courses/106/108/106108100/
2. https://www.youtube.com/watch?v=o6W0opScrKY&list=PLuv3GM6-gsE01L9yDO0e5UhQapkCPGnY3
3. https://www.youtube.com/watch?v=liRPtvj7bFU&list=PL0E131A78ABFBFDD0

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

**CO1**. Design programs on 8085 microprocessors
**CO2**. Implement programs on 8086 microprocessors.
**CO3**. Design interfacing circuits with 8086.
**CO4**. Design and implement 8051 microcontroller-based systems.
**CO5**. Understand the concepts related to I/O and memory interfacing.

**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 | PS O1 | PS O2 |
| **CO1** | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | - | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | - | 2 | 2 | - | - | - | - | - | 1 | 1 | - | - | 2 |
| **CO4** | 2 | - | | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 2 | - | 2 | 1 | - | - | - | - | - | - | - | - | - | - |
| **Average** | **2** | **2** | **2** | **1.5** | **-** | **-** | **-** | **-** | **-** | **1** | **1** | **-** | **-** | **2** |

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

**Pre-Requisites:**

## Module 1: History of hybrid and electric vehicles [12L]

History of hybrid and electric vehicles – social and environmental importance of hybrid and electric vehicles – impact of modern drive-trains on energy supplies – Basics of vehicle performance, vehicle power source characterization transmission characteristics – Mathematical models to describe vehicle performance.

## Module 2: Hybrid traction [8L]

Basic concept of hybrid traction – Introduction to various hybrid drive train topologies – power flow control in hybrid drive – train Topologies-Fuel efficiency analysis.

## Module 3: DC & AC Electrical Machines [14L]

Introduction to electric components used in hybrid and electric Vehicles-Configuration and control of DC motor Drives-Configuration and control of introduction motor drive configuration and control of permanent magnet motor drives configuration and control of switch reluctance- motor drives, drive system efficiency.

## Module 4: Batteries [12L]

Matching the electric machine and the internal combustion engine (ICE) Sizing the propulsion motor, sizing the power electronics selection the energy storage technology – Communications, supporting subsystems.

## Module 5: Energy management and their strategies [6L]

Introduction to energy management and their strategies used in hybrid and electric vehicle Classification of different energy management strategies comparison of different energy management strategies implementation issues of energy strategies.

## Text Books

1. Iqbal Husain, "Electric and Hybrid Electric Vehicles", CRC Press, 2011..
2. Wei Liu, "Hybrid Electric Vehicle System Modeling and Control", Second Edition, WILEY,
3. Sira – Raminez ,R.SilvaOrtigoza, control Design techniques in power electronics Devices, Springer.
4. Siew – Chong tan, Yuk-Ming lai Chi Kong Tse, "Sliding mode control of switching power Converters"..

## Reference Books

1. James Larminie and John Lowry, "Electric Vehicle Technology Explained", Second Edition 2012.
2. Christopher D Rahn, Chao-Yang Wang, "Battery Systems Engineering", Wiley, 2013.

## E-Resources

1.https://nptel.ac.in/courses/108/103/108103009/

2. https://nptel.ac.in/courses/108/102/108102121/

3. https://nptel.ac.in/content/storage2/courses/108103009/download/M12.pdf

4. https://nptel.ac.in/content/storage2/courses/108103009/download/M1.pdf

5. https://nptel.ac.in/content/storage2/courses/108103009/download/M3.pdf

## Course Outcomes

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

**CO 1.** Understand the working of different configurations of electric vehicles, hybrid vehicles and its components.

**CO 2.** ApplythebasicconceptsofbatteriesandMotorsinthedesignofElectricandHybrid Vehicles.

**CO 3.** Differentiate the modes of operation of Hybrid Vehicles.

**CO 4.** Analyze the performance of hybrid vehicles.

**CO 5.** Design the basic parameters of Electric and Hybrid Electric Vehicles.

### 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 | PS O1 | PS O2 |
| CO1 | 3 | - | 2 | - | - | - | 2 | - | - | - | - | - | 3 | 2 |
| CO2 | 3 | 2 | 3 | 2 | - | - | 2 | - | - | - | - | 2 | 2 | 2 |
| CO3 | 3 | 2 | 3 | - | - | - | - | - | - | - | - | - | 2 | 2 |
| CO4 | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - | 3 | 3 |
| CO5 | 2 | 3 | 3 | - | - | - | - | 2 | - | - | - | - | 2 | 2 |
| Average | 2.6 | 2.5 | 2.6 | 2 | - | - | 2 | 2 | - | - | - | 2 | 2.4 | 2.2 |

## Unit I: Characterization of Distributed Systems:

Introduction, Examples of distributed systems, Trends in distributed systems, Focus on resource sharing, Challenges

## Un it II: System Models:

Introduction, Physical models, Architectural models, Fundamental models.

## Unit III: Inter process Communication:

Introduction, The API for the Internet protocols, External data representation and marshalling, Multicast communication, Network virtualization: Overlay networks.

## Unit IV: Remote Invocation:

Introduction, Request-reply protocols, Remote procedure call, Remote method invocation. Indirect Communication: Introduction, Group communication, Publish- subscribe systems, Message queues, Shared memory approaches.

## Unit V: Distributed Objects and Components:

Introduction, Distributed objects, Case study: CORBA, From objects to components.

## Text Book

1. Distributed System: Concepts and Design, Coulouris, Dollimore, Kindberg, 2006, Pearson Education.

## Course Outcomes:

**CO 1**: Understand of the principles and foundations on which the Internet and other distributed systems are based.

**CO 2**: Apply different approaches for supporting distributed applications.

**CO3**: Analyze the role of middleware technologies in designing Distributed systems

**CO 4**: Analyze the sharing of data in distributed environment using various distributed algorithms

**Pre-Requisites:** Engineering Mathematics.

## Module 1:

**Unit 1: Introduction:** Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.

**Unit 2: Allocation:** Linear Programming Problem - Formulation – Graphical solution –Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

## Module 2:

**Unit 1: Transportation problem:** Formulation – Optimal solution, unbalanced transportation problem – Degeneracy

**Unit 2: Assignment problem**: Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

## Module 3:

**Unit 1: Sequencing:** Introduction – Flow –Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through "m" machines

**Unit 2: Replacement:** Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

## Module 4:

**Unit 1: Inventory:** Introduction – Single item, Deterministic models – Types – Purchase inventory models with one price break and multiple price breaks – inventory models with and without shortage cost. Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

**Unit 2: Waiting lines:** Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

## Module 5:

**Unit 1: Theory of Games:** Introduction – Terminology – Solution of games with saddle points and without saddle points- 2 x 2 games – m x 2 & 2 x n games - graphical method – m x n games - dominance principle.

**Unit 2: Dynamic programming:** Introduction – Terminology- Bellman's Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem

## Text Books

1. P. Sankara Iyer, "Operations Research", Mc Graw Hill, 2017.
2. J. K. Sharma, "Operation Research", MacMillan Publishers India Ltd, 4th Edition, 2009.
3. A.C.S Kumar, "Operations Research (Quantitative Analysis for Business decision)", Yesdee, 2015.

## Reference Books

1. Maurice Saseini, Arhur Yaspanand and Lawrence Friedman, "*Operations Research: Methods and Problems*," Literary Licensing Publisher, 2013
2. A. M. Natarajan, P. Bala Subramani and A. Tamilarasi "*Operations Research*" Pearson Education, 4th *Edition*, 2009.
3. Wagner H. M, "*Principles of Operations Research*," PHI Publications, 2nd Edition, 2006.

## E-Resources

1. https://rb.gy/1ckbxh
2. https://nptel.ac.in/courses/112/106/112106134/
3. https://nptel.ac.in/courses/111/107/111107128/

## Course Outcomes

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

**CO1:** Allocate optimally the resources in any industry, to maximize the overall gain and determine the number of each item to be produced / procured, and the optimal product mix, within the framework of constraints in any organization

**CO2:** Find the optimal number of units to be transported such that the total transportation cost will be minimum and Assign the required men / machines to perform the given tasks in an optimal way

**CO3:** Schedule and sequence production runs by proper allocation of machines and men to get maximum gain or profit and Compute the economic order quantity

**CO4:** Decide the optimal inventory to be maintained under different situations involving different types of demand and inventory costs, find how to strike a balance between the waiting time cost and service facility cost for different waiting line models

**CO5:** Find how to strike a balance between the waiting time cost and service facility cost and apply the Dynamic Programming model to practical problems like finding the shortest path for a salesman, optimal solution to a linear programming problem.

## CO-PO/PSO Mapping

| Course Outcomes | Program Outcomes(POs)/Program Specific Outcomes(PSOs) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 3 | 2 | - | - | 3 | - | - | - | - | - | 2 | 2 | 2 |
| **CO2** | 3 | 3 | 3 | - | - | 3 | - | - | - | - | - | 2 | 3 | 3 |
| **CO3** | 2 | 3 | 2 | - | - | 3 | - | - | - | - | - | 2 | 2 | 2 |
| **CO4** | 3 | 3 | 2 | - | - | 3 | - | - | - | - | - | 2 | 3 | 3 |
| **CO5** | 2 | 3 | 1 | - | - | 3 | - | - | - | - | - | 2 | 2 | 2 |
| **Average** | 2.4 | 3 | 2 | - | - | 3 | - | - | - | - | - | 2 | 2.4 | 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 III Year - II Sem** | | | |
|---|---|---|---|---|---|
| Course Code: L32OJ | **INTRODUCTION TO SURFACE MINING (OPEN ELECTIVE – II)** | L | T | P | D |
| Credits: **3** | | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Nil

**Course Objectives**:

This course will enable students to:

1. To introduce surface mining terms and applicable conditions
2. To acquaint with different machinery used in surface mining
3. To get idea about Drilling and blasting of surface ore bodies
4. To get idea about lighting, dust, and slopes in surface mines.
5. To know about ore and waste transportation.

**Module 1**

Definition, Terminology, Applicability and limitations of surface mining, Classification, Advantages, and dis-advantages of surface mining.

**Module 2**

Introduction to surface mining machinery: Equipment selection; Working with rippers, shovels, draglines, shovel-dragline combination; bucket wheel excavator. Disposal of OB/waste material

**Module 3**

Drilling & blasting**:** Drilling mechanism, drilling patters, Drill bits Explosives, Blasting accessories, Bulk explosives, problems in blasting.

**Module 4**

Basics of Mine lighting, Sources of dust in surface mining, dust control, and slope stabilization

**Module 5**

Methods of excavation & transportation – shovel-dumper combination, draglines, surface miner, bucket wheel excavator. Impacts on environment due to surface mining

**Text Books**

1. D.J. Deshmukh, Elements of Mining Technology, Vol 1, Central Techno, 7th Edition, 2001.
2. Principles & Practices of Coal Mining, R.D. Singh

**Reference Books**

1. Surface Mining Technology, by Prof S.K. Das, Lovely Prakashan, Dhanbad

**Course Outcomes**

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

**CO1:** Understand about surface mining terms and conditions of applicability

**CO2:** Learn about different machinery used in surface mining

**CO3:** Learn drilling and blasting in surface mining

**CO4:** Understand mine lighting, dust, and slopes in surface mining

**CO5:** Understand the transportation of ore and waste in surface mining.

**Course Objectives:**

1. The main objective of the IPR is to make the students aware of their rights for the protection of their invention done in their project work.
2. To get registration in our country and foreign countries of their invention, designs and thesis or theory written by the students during their project work and for this they must have knowledge of patents, copy right, trademarks, designs and information Technology Act.
3. Further teacher will have to demonstrate with products and ask the student to identify the different types of IPR's.

**UNIT - I:**

**Introduction to Intellectual property:** Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT - II:**

**Trade Marks:** Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

**UNIT - III:**

**Law of copy rights:** Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

**UNIT - IV:**

**Trade Secrets:** Trade secretes law, determination of trade secretes status, liability for misappropriations of trade secrets, and protection for submission, trade secretes litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

**UNIT - V:**

**New development of intellectual property:** New developments in trade mark law; copy right law, patent law, intellectual property audits.

> International overview on intellectual property, international - trade mark law, copy right law, international patent law, and international development in trade secrets law.

**Course outcomes:**

The students once they complete their academic projects, they get awareness of acquiring the patent and copyright for their innovative works. They also get the knowledge of plagiarism in their innovations which can be questioned legally.

**Text Books:**

1. Intellectual property right, Deborah, E. Bouchoux, cengage learning.
2. Intellectual property right - Unleashing the knowledge economy, prabuddhaganguli, Tata McGraw Hill Publishing Company Ltd.
3. Managing Intellectual Property-The Strategic Imperative, Second Edition by Vinod V Sople,

PHI.
4. Intellectual Property –Copyrights, Trademarks and patents by Richard Stim, Cengage Learning.
5. Niraj Pandey & Khushdeep Dharani –Intellectual Property rights
6. V.K. AHUJA – Law relating to Intellectual Property

**Pre-Requisites:**

### Module 1: Linear Systems of Equations  [10L]

Iterative methods for solving large linear systems of algebraic equations: Jacobi, Gauss-seidel and S.O.R methods - Conditions for convergence of them - Methods for accelerating convergence: Lyusternite's & Aitken's methods - Optimum acceleration parameter for S.O.R method.

### Module 2: One Dimensional Parabolic Equations [9L]

Explicit and Crank-Nicolson Schemes for - Weighted average approximation - Derivative boundary conditions - Truncation errors - Consistency, Stability and convergence - Lax Equivalence theorem.

### Module 3: Matrix Norms &Two Dimensional Parabolic Equation  [10L]

Vector and matrix norms - Eigen values of a common tridiagonal matrix - Gerischgorin's theorems - Stability by matrix and Fourier-series methods - A.D.I. methods.

### Module 4: Hyperbolic Equations  [10L]

First order quasi-linear equations and characteristics - Numerical integration along a characteristic - Lax- Wendroff explicit method - Second order quasi-linear hyperbolic equation - Characteristics - Solution by the method of characteristics.

### Module 5: Elliptic Equations [10L]

Solution of Laplace and Poisson equations in a rectangular region - Finite difference in Polar coordinate Formulas for derivatives near a curved boundary when using square mesh - Discretisation error - Mixed Boundary value problems

### Text Books

1. Chapra. S.C., and Canale.R.P., "Numerical Methods for Engineers, Tata McGraw Hill,   5 th Edition, New Delhi, 2007.
2. Equations", John Wiley and sons, New York, 1980.
3. Smith G.D., "Numerical Solution of P.D.E.", Oxford University Press, New 2. York, 1995

### Reference Books

1. Morton K.W., Mayers, D.F., "Numerical Solutions of Partial Differential Equations", Cambridge University Press, Cambridge, 2002.
2. Iserles A., "A first course in the Numerical Analysis of Differential Equations", Cambridge University press, New Delhi, 2010. xx t u u 
3. Mitchel A.R. and Griffiths S.D.F., "The Finite Difference Methods in Partial Differential

### E-Resources

1. https://www.purplemath.com/modules/systlin1.htm
2. https://nptel.ac.in/courses/111/107/111107063/
3. https://www.researchgate.net/publication/227760098_Numerical_solution_of_twodimensional_parabolic_equation_subject_to_nonstandard_boundary_specifications_using_the_pseudospectral_Legendre_method

4. https://link.springer.com/chapter/10.1007/978-3-662-09207-1_2
5. https://www.researchgate.net/publication/310744390_Numerical_Solutions_of_Elliptic_Partial_Differential_Equations_by_Using_Finite_Volume_Method

## Course Outcomes

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

**CO1**. Know the knowledge of solving large number of algebraic linear equation.
**CO2**. Understand the knowledge of solving one dimensional parabolic equations by numerical methods
**CO3**. Recognize the knowledge of solving two dimensional parabolic equations by numerical methods.
**CO4**. Apply and understand the knowledge of solving hyperbolic equation by numerical methods
**CO5**. Know the knowledge of solving elliptic equations by numerical methods.

## 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 | 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**

**Pre-Requisites:** Foundations of Mechanics & Physics

### Module- 1: Special Theory of Relativity   [9L]

Introduction, Concept of theory of relativity, Frames of reference-Inertial, noinertial; Galilean transformation equations, Michelson-Morley experiment, Einstein theory of relativity, Lorentz transformation of space and time, Length contraction, Time dilation, Variation of mass with velocity, Relativistic relation between energy and momentum.

### Module -2:  Holography  [9L]

Introduction, Basic principle, Construction and Reconstruction of Hologram, Properties of Hologram, Types of Holograms, Applications- Holographic Interferometry, Acoustic Holography, Holographic Microscopy.

### Module -3:  Thin films Synthesis [9L]

Introduction, Deposition Techniques-Pulsed Laser Deposition (PLD), Spray Pyrolysis; Nucleation and growth of the thin films, properties (Mechanical, Electrical, Magnetic and Optical).

### Module -4:  Photonic Crystals  [9L]

Important features of photonic crystals, Presence of photonic band gap, anomalous group velocity dispersion, Micro cavity, effects in Photonic Crystals, fabrication of photonic Crystals, Dielectric mirrors and interference filters, PBC based LEDs, Photonic crystal fibers (PCFs), Photonic crystal sensing.

### Module- 5:  Solar cell Physics[9L]

Single, poly and amorphous silicon, GaAs, CdS, Cu2S, CdTe; Origin of photovoltaic effect, Homo and hetero junction, working principle of solar cell, Evaluation of Solar cell parameters, I-V, C-V and C-f characteristics.

### Text Books

1. R K Gaur and SL Gupta, "Engineering Physics" Dhanpat Rai Publications, 8th revised Edition, 2006.

2. B K Pandey and S Chaturvedi, "Engineering Physics" Cengage Learning India, Revised Edition, 2014.

### Reference Books

1.R F Bun shah, "Hand Book of Technologies for Films and coating", Noyes publishers,1st Edition, 1996.

2.B E A Saleh and A C Tech, "Fundamentals of Photonics", John Wiley and Sons, New York, 1st Edition, 1993.

### E-Resources

1.http://physics.mq.edu.au/~jcresser/Phys378/LectureNotes/SpecialRelativityNotes. pdf

2. http://www.kfupm.edu.sa/centers/CENT/AnalyticsReports/KFUPM-TFSCDec20.pdf

3. https://www.journals.elsevier.com/solar-energy-materials-and-solar-cells

4. https://www.journals.elsevier.com/journal-of-alloys-and-compounds/

5. http://aip.scitation.org/journal/apl
6. http://nptel.ac.in/courses/115101011/

## Course Outcomes

After completion of this course the student is able to

1. Explain special theory of relativity and apply its concepts in various fields of physicsand engineering.

2. Analyze the basic concepts of Holography and applications.

3. Identify different concepts of film deposition.

4. Apply basic knowledge on the photonic crystals.

5. Apply the basic concepts of solar cell physics.

**Pre-Requisites:** Nil

## Module 1: Synthesis of Nano materials [8L]

Introduction -synthesis of Nanostructure materials, Bottom-up approach and Top-down approach with examples-sol-gel method-solvothermal and hydrothermal routes, Chemical Vapor Deposition and precipitation methods.

## Module 2: Properties of Nano materials [10L]

Properties of Nanomaterials-Electronic properties, Energy bands and gaps in semiconductors, Fermi Surfaces-Optical properties- Fluorescence, Photoluminescence, Electroluminescence. Magnetic properties-mechanical properties-thermal properties.

## Module 4: Instrumental Analysis [10L]

Characterization techniques- Principle and block diagram of Scanning Electron Microscopy (SEM), Electron Dispersion Spectroscopy(EDS). Principle and block diagram of Electron Microscopy (TEM), Dynamic Light Scattering (DLS) and Atomic Force Microscopy(AFM) -Illustrative examples.

## Module 5: Carbon Nano structures and Applications [10L]

Carbon Nano structures, carbon clusters, types and preparation of carbon Nano tubes-optical and telecommunication applications, Nano structured crystals (graphite), graphene, carbon fibers, fullerenes and their applications. Nano solar cells and its applications.

## Module 5: Environmental Nanotechnology [9L]

Implications of Nanotechnology & Research needs-Nanostructured Catalysts $TiO_2$ Nanoparticles for Water purification- Nano membranes in drinking water treatment and desalination, Nanomembranes in Sea desalination-Nano particles for treatment of Chlorinated Organic Contaminants.

## Text Books

1. "Nanotechnology a gentle introduction to the next big idea",Mark A. Ratner, D. Ratner. Pearson Education Inc., Asia, 2003.
2. "Nano: The essentials-understanding Nanoscience and Nanotechnology", Pradeep.T. Tata Mc.Graw Hill, New Delhi, 2007.

## Reference Books

1. "Green Chemistry: Theory and Practice", Anastas, P.; Warner, J. Oxford University Press: London, 1998.
2. "Nanomaterials: Synthesis, Characterization, and Applications", A. K. Haghi, Ajesh K. Zachariah, Nandakumar Kalariakkal. Apple Academic Press, 2013.
3. "Nanomaterials and Nanochemistry", Brechignac C., Houdy P., Lahmani M. (Eds.) (Springer,) 748p. ISBN 978-3-540-72993-8, 2007
4. "Principles of Nanotechnology", Phanikumar. SciTech Publications 2nd Edition, 2010.

5. "Environmental Nanotechnology"Preetijain, Shankar lalGarg. Lap lambert Academic publishing, 2015.

## E-Resources

1. https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/nanochemistry.html
2. https://www.sciencedirect.com/book/9780444519566/nanochemistry
3. https://www.researchgate.net/publication/320068992_Introduction_to_Nano-chemistry_and_Nano-materials
4. https://www.kemi.dtu.dk/english/research/organic-inorganic-chemistry/nanochemistry
5. https://www.cambridge.org/core/books/engineering-chemistry/nanochemistry/D6DB35E32E530525DD927E68CED43197

## Course Outcomes

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

1. Learn the different synthetic methods of the Nano materials.
2. Know the student Electronic, optical and magnetic properties of Nano materials.
3. Acquire the knowledge various instrumental methods of analysis (TEM, EDS, SEM, DLS &AFM).
4. Know the carbon nanotubes, carbon Nano fibers, Nano structured catalysts and Nano solar cells.
5. Learn usage of Nano materials in the purification of water.

**Pre-Requisites: Nil**

**Objectives:**

1. Know the working experience in the group and team
2. Understand the process and role of the team
3. Apply the knowledge of team building
4. Understand the role of team leader.
5. Plan the meetings and understanding the role of meetings

## Module -I Working in Groups and Teams

Introduction-defining Types of Groups and Teams- Understanding the role of Teams in Organization; Recognizing differences between group and Teams-ensuring team success-empowering teams- working with a distributed team- technology @work: virtual worlds.

## Module -II Exploring Team Roles and Processes

Defining common team roles-selecting team members-choosing the optimal team size-establishing team rules-clarifying team objectives-making collective decisions etc.

## Module -III Building and Developing Team

Understanding the benefits of working in teams-fostering Resistance-using team-building activities-creating a team identity-coping with conflict and ego-dealing with difficult team members and celebrating successes.

## Module -IV Leading a Team

Pursuing team leadership-preparing to be a team leader-getting start with your team-taking a project management approach- managing a team diplomatically-being sensitive to intangibles and concluding team activities.

## Module -V Managing Meetings

Scheduling meeting-developing meeting agenda- planning meetings-understanding the role of meetings-conducting meetings effectively-taking notes and publishing minutes-concluding meetings and creating action plans and solving common meeting problems.

**Reference/text book:**

1) Butterfield, Jeff. Soft Skills for Everyone. Delhi: Cenege., 2010.

**Course outcomes:**

1. Recognize differences between group and team, ensuring team success, and empowering teams.

2. Define common team roles, establishing team rules, selecting team members, and making collective decisions
3. Understand the benefits of working in teams, fostering Resistance, using team-building activities
4. Manage a team diplomatically, and preparing to be a good team leader.
5. Create action plans and solving common meeting problems

<table>
<tr><td colspan="15" align="center"><b>CO-PO/PSO Mapping Chart<br>(3/2/1 indicates strength of correlation)<br>3 – Strong; 2 – Medium; 1 - Weak</b></td></tr>
<tr><td rowspan="2"><b>Course Outcomes (COs)</b></td><td colspan="12" align="center"><b>Program Outcomes (POs)</b></td><td colspan="2" align="center"><b>Program Specific Outcomes*</b></td></tr>
<tr><td><b>PO 1</b></td><td><b>PO 2</b></td><td><b>PO 3</b></td><td><b>PO 4</b></td><td><b>PO 5</b></td><td><b>PO 6</b></td><td><b>PO 7</b></td><td><b>PO 8</b></td><td><b>PO 9</b></td><td><b>PO 10</b></td><td><b>PO 11</b></td><td><b>PO 12</b></td><td><b>PSO 1</b></td><td><b>PSO 2</b></td></tr>
<tr><td><b>CO1</b></td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>3</td><td>2</td><td>..</td><td>3</td><td>..</td><td>..</td></tr>
<tr><td><b>CO2</b></td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>3</td><td>2</td><td>..</td><td>3</td><td>..</td><td>..</td></tr>
<tr><td><b>CO3</b></td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>3</td><td>2</td><td>..</td><td>3</td><td>..</td><td>..</td></tr>
<tr><td><b>CO4</b></td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>3</td><td>2</td><td>..</td><td>3</td><td>..</td><td>..</td></tr>
<tr><td><b>CO5</b></td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>3</td><td>2</td><td>..</td><td>3</td><td>..</td><td>..</td></tr>
<tr><td><b>Total</b></td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>..</td><td>3</td><td>2</td><td>..</td><td>3</td><td>..</td><td>..</td></tr>
</table>

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | **B. Tech III Year-I Sem** | | | |
|---|---|---|---|---|---|
| Course Code: L320P | **Essence of Indian Traditional Knowledge** (COMMON TO: All branches) | L | T | P | D |
| Credits: **3** | | **3** | **0** | **0** | **0** |

**Pre-Requisites:**

**Module 1: Introduction to Culture**

Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

**Module 2: Indian Languages, Culture and Literature**

Indian Languages and Literature-l the role of Sanskrit, significance of scriptures to scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India

Indian Languages and Literature-II. Northern Indian languages & literature

**Module 3: Religion and Philosophy**

Religion and Philosophy in ancient India Religion and Philosophy in Medieval India Religious Reform Movements in Modern India (selected movements only)

**Module 4: Fine Arts in India (Art, Technology & Engineering)**

Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient medieval, and modern) Science and Technology in India, development of science in ancient medieval and modern India.

**Module 5: Education System in India**

Education in ancient, medieval and modern India, aims of education, subjects' languages Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India.

**Text Books**

1. Kapil Kapoor. "Text and Interpretation: The India Tradition" ISBN: 81246013375 2005.
1. "Science in Sanskrit". Samskrita Bharti Publisher, ISBN 978-8187276731.2007

**Reference Books**

1.NCERT, "Position paper on Arts, Music, Dance and Theatre". ISBN 81-7450 494- 200.

**Course Outcomes**

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

COI: Understand philosophy of Indian culture.

CO2: Distinguish the Indian languages and literature

CO3: Learn the philosophy of ancient, medieval and modern India.

CO4: Acquire the information about the fine arts in India.

COS: Know the contribution of scientists of different eras.

# Open Elective-III

**Pre-Requisites: NIL**

## Module 1: Fundamentals of Traffic Engineering

**Unit-I:**

Road User Characteristics, Vehicular Characteristics, Applications of Traffic Control Devices,Traffic signs, Road Marking.

## Module 2: Introduction to Road Safety

**Unit-I:**

Accident Situation in India, International Comparison of Accident Data, Standard Definitions byIRC, Collection of Accident Data, Collision and Condition Diagrams.

## Module 3: Statistical Methods and Analysis of Accident Data

**Unit-I:**

Methods in Analysis of accident Data, Regression Method, Poisson Distribution, Chi-SquaredDistribution, Statistical Comparisons, Black Spot Identification & Investigations.

## Module 4: Road & its Effect on Accidents Unit-I:

Factors Causing Accidents, Skidding, Factors Determining Skid Resistance, Pedestrian Safety,Measures to Increase Pedestrian Safety, Safety Improvement Strategies.

## Module 5: Accident Mitigation Measures

**Unit-I**

Accident prevention by better planning, Accident prevention by better design of roads, Highway operation and accident control measures, Highway Safety Measures during construction, Highwaygeometry and safety.

## Text Books

1. 'Transport planning and Traffic Engineering" by Dr. L. R. Kadiyali, Khanna Publications 9th Edition (2017).
2. 'Principles of Transportation Engineering'' by Partha Chakroborty &Aminesh Das; Prentice Hall of India, 2nd edition (October 2017).

## Reference Books

1. Fundamentals of Traffic Engineering, Richardo G Sigua Road Safety by NCHRP.

## E- Resources

1. https://nptel.ac.in/courses/105/101/105101087/

## Course Outcomes

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

**1.** Understand the Traffic characteristics

**2.** Analyze Collision and Condition Diagrams.

**3.** Describe Road & its Effect on Accidents

**4.** Understand the various Accident prevention measures.

**5.** Understand the statistical analysis of traffic flow variables.

| Course Outcomes (COs) | CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - | 1 | 1 |
| CO2 | 1 | 1 | 1 | - | - | 3 | 2 | - | - | - | - | - | 2 | 2 |
| CO3 | 1 | 1 | 1 | - | - | 3 | 1 | - | - | 2 | - | 2 | 1 | 1 |
| CO4 | 1 | 1 | 1 | - | - | 2 | - | - | - | - | - | 2 | 1 | 2 |
| CO5 | 1 | 1 | 1 | - | - | 2 | - | - | - | - | - | 2 | 1 | 1 |
| Average | 1 | 1 | 1 | - | - | 2 | 0.6 | - | - | 0.4 | - | 1.2 | 1.2 | 1.4 |

**Pre-Requisites:**

Knowledge on Programming for Problem Solving

**Course Objectives:**

The students should be able to

1. Familiar with OOPs, constructors, and string handling functions
2. Understand inheritance and polymorphism.
3. Gain knowledge of with packages and interfaces
4. Understand the with exception handling and multithreading.
5. Know the applet programming, event handling and scripting.

**Module 1:**

Introduction: OOP concepts, history of Java, Java buzzwords, data types, variables, scope and lifetime of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program.

Classes and Objects: concepts of classes, objects, constructors, methods, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion.

String handling: String, String Buffer, String Tokenize.

**Module 2:**

**Inheritance:** base class object, subclass, member access rules, super uses, using final with inheritance, method overriding, abstract classes

Interfaces: defining an interface, implementing interface, differences between classes and interfaces and extending interfaces.

**Packages:** Defining, creating and accessing a package, importing packages, access control, exploring package - java.io

**Module 3:**

**Exception handling:** concepts of exception handling, benefits of exception handling, exception hierarchy, checked and unchecked exceptions, usage of-try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

**Module 4:**

**Multithreading:** differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.

**Applets:** concepts of applets, differences between applets and applications, life cycle of applet, types of applets, creating applets, passing parameters to applets.

**Module 5:**

**Event Handling:** events, event sources, event classes, event listeners, delegation event model, handling mouse and key board events, adapter classes. The AWT class hierarchy, user interface components-labels, buttons, canvas, scrollbars, text components, checkbox, checkbox groups, choices, lists

**Textbooks**

1. Java The complete reference, 8th edition, Herbert Schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pears on education.

**Reference Books**

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons.
2. An Introduction to OOP, second edition, T. Budd, Pearson education.
3. Introduction to Java programming 6th edition, Y. Daniel Liang, Pearson education.

### E - Resources:

1. http://www.javasoft.com
2. http://www.w3schools.com

**Course Outcomes**

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

**CO1:** Use OOP concepts in problem solving.

**CO2:** Demonstrate Inheritance and Polymorphism

**CO3:** Create user defined Packages and Interfaces

**CO4:** Illustrate the concept of Exception handling and Multithreading.

**CO5:** Design GUI based applications using Applet Programming and Event Handling

**Pre-Requisites:**

1. Data Structures
2. Design and Analysis of Algorithms
3. Python Programming
4. Mathematics for Machine Learning

**Course objectives:**

**The student will:**

1. Become familiar with the fundamental concepts of Neural Networks and its applications.

2. Learn various learning strategies for solving real world problems.

3. Demonstrate various architectures of Artificial neural networks.

4. Summarise the limitations of the perceptron model

5. Understand the paradigms of associative memories.

**Module 1:**
**INTRODUCTION TO NEURAL NETWORKS**

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron,

Biological and Artificial Neuron Models, Characteristics of ANN

McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

**Module 2:**
**ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS**

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules.

**Module 3:**
**SINGLE LAYER FEED FORWARD NETWORKS**

Introduction, Perceptron Models: Discrete, Continuous and Multi-Category
Training Algorithms: Discrete and Continuous Perceptron Networks, Limitations of the Perceptron Model.

**Module 4:**
**MULTI- LAYER FEED FORWARD NETWORKS**

Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm

Kolmogorov Theorem, Learning Difficulties, and Improvements.

**Module 5:**

**ASSOCIATIVE MEMORIES:** Linear Association, Basic Concepts of recurrent Auto associative memory: rentrieval algorithm, storage algorithm; By directional associative memory, Architecture, Association encoding & decoding, Stability.

**SELF ORGANIZING NETWORKS:** Unsupervised learning of clusters, winner-take-all learning, recall mode, Initialisation of weights, seperability limitations

**Text Books:**

1. Laurene Fausett, "Fundamentals of Neural Networks" , Pearson Education,2004..

2. Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2003.

3. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networks using MATLAB 6.0", TATA Mc Graw Hill, 2006.

**Reference Books:**

1. S. Rajasekharan and G. A. Vijayalakshmi pai, "Neural Networks, Fuzzy logic,

Genetic algorithms: synthesis and applications", PHI Publication, 2004.

2. Timothy J. Ross, " Fuzzy Logic with Engineering Applications", Tata McGraw-

Hill Inc. 2000

**Course outcomes:**

**The student will be able to:**

1. Analyze Neural Networks and its applications.

2. Apply learning strategies for solving real world problems.

3. Implement various architectures of Artificial neural networks.

4. Categorize the merits of various perceptron models.

5. Construct the paradigms of associative memories.

**Module I: Introduction to Health Care Data Analytics & Electronic Health Record**
**Unit I:** Introduction to Health care data sources and basic analytics, advanced data analytics, Applications and practical systems for health care, resources for health care data analytics,
**Unit II:** Electronics Health Records, Components of EHR, Coding System of EHR, Benefits of EHR- Barrier to Adopting EHR Challenges-Phenotyping Algorithms, Conclusion.

## Module II: Biomedical image modalities and Mining of Sensor Data in Health Care

**Unit 1:** Biomedical image modalities, Object Detection, Image Segmentation, Image Registration, Feature Extraction, Conclusion and Feature work.
**Unit II:** Introduction Mining sensor data in medical informatics, scope and challenges,
Challenges in the Health care data analysis, Sensor Data Mining Applications, Non clinical Health Care Application, Summary and concluding remarks.

## Module III: Biomedical Signal Analysis and Genomic data analysis

**Unit I**: -introduction types of biomedical signal analysis, ECG signal analysis, denoising of signals, multivariate bio medical signal analysis, cross correlation analysis.
**Unit II**: introduction genomic data generation, methods and standards for genomic data analysis, types of computational genomics studies towards personalized medicine, genetic and genomic study to the bed side of personalized medicine, concluding remarks.
**Module IV: Natural language processing and data mining for clinical text & Biomedical literature Unit I**: Introduction to Natural language processing, Mining information for clinical text, Challenges of processing clinical reports, clinical applications, conclusions.
**Unit II**: Introduction terminology acquisition and management information extraction, text mining environments, applications integration with clinical text mining, conclusions.
**Module V: Social media and analytics for health care and Advanced data analytics for health care Unit I:** Introduction to social media analysis for detection and trapping of infectious disease outbreaks, social media analysis for public health research and analysis of social media used in health care, conclusions.
**Unit II:** introduction basics statistical predication model, alternative, clinical predication model, survival models, evaluation and validation and conclusion.

## TEXT BOOKS

1. Chandan K. Reddy and Charu C Aggarwal, "Healthcare data analytics", Taylor & Francis,2020 Edition

## REFERENCE BOOKS

1. Hui Yang and Eva K. Lee, "Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, Wiley, 2016.

**Pre-Requisites:**

**Course Objectives:**

The students will

1. To understand the basic principles of programming and of implementing mathematical concepts in MATLAB.
2. To write numerical algorithms with MATLAB Programming language.
3. To evaluate the computational results using graphical representations.
4. To gain knowledge about advanced MATLAB Programming methods.
5. To gain knowledge on Simulink used in MATLAB.

**Module 1: Introduction to MATLAB [10L]**

**Unit-I: [6L]**

Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window).

**Unit-II: [4L]**

Operations with Variables, Naming and Checking Existence, Clearing Operations, Commands, Data types, Operators.

**Module 2: Data Flow in MATLAB [10L]**

**Unit-I: [10L]**

Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Numbers, Strings, Functions, File Input-Output, Importing and Exporting of data.

**Module 3: MATLAB Programming [10L]**

**Unit-I:**

Conditional Statements, Loops, Writing Script Files, Error Correction, saving Files, Worked out Examples.

**Module 4: MATLAB Advanced  [10L]**

**Unit-I: [10L]**

Plotting, Graphics, Creating Plot & Editing Plot, GUI (Graphical User Interface). Matlab-Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

**Module 5: SIMULINK [9L]**

**Unit-I: [9L]**

Introduction, Importance, Model Based Design, Tools, Mathematical Modeling, Converting Mathematical Model into Simulink Model, Running Simulink Models, Importing Exporting Data, Solver Configuration, Masking Block/Model.

**Text Books**

1. Getting Started WithMatlab: A Quick Introduction For Scientists And Engineers (English) by Rudra Pratap, OXFORD University Press.
2. MATLAB Programming by Y. Kirani Singh, B.B. Chaudhuri, PHI Publication.

**3. Reference Books**

4. MATLAB® Programming For Engineers, Fourth edition by Stephen J. Chapman.
5. Applied Numerical Methods Using MATLAB 1st Edition by Won Y. Yang Wenwu Cao, Tae-Sang Chung, John Morris.

## Course Outcomes

**CO1**. Translate mathematical methods to MATLAB code.
**CO2**. Generalize results and represent data visually.
**CO3**. Apply computer methods for solving a wide range of engineering problems.
**CO4**. Utilize computer skills to enhance learning and performance in other engineering and science courses.
**CO5**. acquire knowledge of Advanced Matlab programming methods and Simulink.

## 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** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO3** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO5** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Average** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

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

**Pre-Requisites:** Nil

**Course Objectives:**

Students will learn to:

1. To understand the concepts of measurement technology.

2. To learn the different sensors used to measure various physical parameters.

3. To Acquire knowledge on Optical sensors.

4. To understand the concepts Acoustic sensors.

5. To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

### Module 1:

**Unit-I: Introduction**

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers.

**Unit-II: Performance measures of sensors**

Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

### Module 2:

**Unit-I: Motion, Proximity And Ranging Sensors**

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive

**Unit-II:**

LVDT – RVDT – Synchro – Microsyn, Accelerometer.,– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

### Module 3:

**Unit-I: Force, Magnetic And Heading Sensors**

Strain Gage, Load Cell, Magnetic Sensors–types, principle, requirement and advantages: Unit 2: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers.

### Module 4:

**Unit-I: Optical, Pressure And Temperature Sensors**

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD.

**Unit-II:**

Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors, Film sensor, MEMS & Nano Sensors, LASER sensors.

### Module 5:

**Unit-I: Signal Conditioning And Daq Systems**

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi-channel data acquisition

**Unit-II:**

Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring

**Text Books**

1. S Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill,2009.
2. Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12th edition, Dhanpat Rai & Co, New Delhi,2013.

**Reference Books**

1. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi,2010.
2. 1. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications,1999.
3. 2. Richard Zurawski, "Industrial Communication Technology Handbook" 2nd edition, CRC Press, 2015.

**E-Resources**

1. https://www.sciencelearn.org.nz/resources/1602-electricity-and-sensors
2. https://predictabledesigns.com/introduction-to-electronic-sensors/

**Course Outcomes**

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

**CO1**. Expertise in various calibration techniques and signal types for sensors.

**CO2**. Apply the various sensors in the Automotive and Mechatronics applications.

**CO3**. Study the basic principles of various smart sensors..

**CO4**. Apply Optical and Acoustic sensors in Home Appliances..

**CO5**. Implement the DAQ systems with different sensors for real time applications.

**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 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| CO2 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | - | - | - |
| CO3 | 3 | 2 | - | 3 | - | - | - | - | - | - | - | - | - | - |
| CO4 | 3 | 1 | - | | - | - | - | - | - | - | - | - | - | - |
| CO5 | 2 | 2 | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| Average | 2.4 | 2 | 2.5 | 2.67 | - | - | - | - | - | - | - | - | - | - |

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

**Course Objectives:**

**This course will enable students:**

1. To elucidate the fundamentals of various energy sources and future energy requirement.
2. To impart a thorough knowledge about the application of solar energy.
3. To inculcate the students on feasibility and limitations of wind Energy Systems.
4. To analyse the principle and operation of Biomass energy.
5. To analyse the principle and operation of ocean energy and it's potential in india.

**Module 1: Introduction [9L]**

Introduction to energy Sources-Renewable and non-renewable energy sources –energy consumption as a measure of Nation's development – Strategy for meeting the future energy requirement – Global and national level energy scenarios –Prospects of renewable energy sources.

**Module 2: Solar Energy [12L]**

Fundamentals of Solar Energy, Solar Radiation on Earth's surface, Solar radiation geometry, Solar radiation measurements, Solar radiation data, Solar radiation on horizontal and tilted surfaces. Solar Thermal conversion: Flat plate collectors and concentrated collectors, collector efficiency. Solar applications: Heating, distillation, pumping, drying, cooking and solar electric power generation

**Module 3: Wind Energy [10L]**

Basic principle of wind energy conversion, site selection consideration, Betz Limit, Aerodynamics of wind turbine, basic components of wind energy conversion systems (WECS), types of WECS, applications of wind energy, safety system.

**Module 4: Bio-Mass [9L]**

Energy from Bio Mass: Various fuels, Conversion technologies, Aerobic digestion and anaerobic digestion, types of Bio-gas digesters, applications of bio-gas plants Factors affecting generation of bio gas, Community biogas plant, compare biomass and biogas.

**Module 5: Geo-Thermal and Ocean Energy        [10L]**

Geothermal energy: Resources, methods of harnessing the energy, potential in India **Ocean energy:** Principle of ocean thermal energy conversion (OTEC), types: open cycle OTEC system, closed cycle and hybrid cycle, applications. Tidal and wave energy: Potential and conversion techniques.

**Text Books**

1. "G. D. Rai", "Non-Conventional Energy sources", Khanna publishers, 2004
2. "John Twidell & Wier", "Renewable Energy Resources", CRC Press, 2009.

**Reference Books**

1. "D. P .Kothari, Singal, Rakesh and Ranjan", "Renewable Energy sources and Emerging Technologies", PHI, 2009.
2. "F. C. Treble", Generating Electricity from Sun, Pergamon Press, 1st Edition 1991
3. "C. S. Solanki", "Solar Photovoltaics - Fundamentals- Principles and Applications", PHI, 2009
4. "S. P. Sukhatme", "Solar Energy Principles and Application", TMH, 2009.
5. Agarwal, M.P., 'Future Sources of Electrical Power', S.Chand & Co. Ltd, New Delhi, 1999.

**E-Resources**

1. https://nptel.ac.in/courses/121106014

2. https://www.energy.gov/eere/geothermal/electricity-generation
3. https://beeindia.gov.in/sites/default/files/4Ch12.pdf
4. https://www.ireda.in/home
5. https://mnre.gov.in/wind/current-status/
6. https://mnre.gov.in/solar/current-status/
7. https://mnre.gov.in/bio-energy/current-status

**Course Outcomes**

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

**CO 1.** Understand the need of utilization of alternate energy resources & fundamentals of various non-conventional energy Systems.

**CO 2.** Analyze solar thermal and photovoltaic systems and related technologies for energy conversion.

**CO 3.** Understand Wind energy conversion and devices available for it.

**CO 4.** Understand Biomass conversion technologies, Geo thermal resources and energy conversion principles and technologies.

**CO 5.** Realize Power from oceans (thermal, wave, tidal) and conversion devices

**CO-PO/PSO Mapping**

| Course Outcomes | Program Outcomes(POs)/Program Specific Outcomes(PSOs) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PS O1 | PS O2 |
| **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 IT III Year-II Sem | | | |
|---|---|---|---|---|---|
| Course Code: **L32OY** | **Soft Computing** **(OPEN ELECTIVE - III)** | L | T | P | D |
| Credits: **3** | | **3** | **0** | **0** | **0** |

**Unit I Soft Computing**:

Introduction to soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing.

**Unit II Artificial Intelligence**:

Introduction, Various types of production systems, characteristics of production systems, breadth first search, depth first search techniques.

**Unit III Neural Network:**

Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, characteristic and applications of ANN.

**Unit IV: Perceptron**

Perceptron training algorithm, Linear separability.

**Unit V Genetic algorithm**:

Fundamental, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modelling.

**Text Books:**

1. S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications, 2nd Edition, 2011.

2. S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications, PHI Publication, 1st Edition, 2009.

**Course Outcomes**: At the end of the course the student should be able to

**CO 1**. Learn about soft computing techniques and their applications

**CO 2**. Analyze various neural network architectures

**CO 3**. Understand perceptrons.

**CO 4**. Define the fuzzy systems

**CO 5**. Analyze the genetic algorithms and their applications

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

## Module 1

**Unit 1:** Introduction: Robotics-Introduction-classification with respect to geometrical configuration (Anatomy), Controlled system & chain type: Serial manipulator & Parallel Manipulator.

**Unit 2:** Components of Industrial robotics - precession of movement - resolution, accuracy & repeatability – Dynamic characteristics- speed of motion, load carrying capacity & speed of response

## Module 2

**Unit 1:** Grippers - End effectors: Mechanical gripper – Magnetic – Vacuum cup and other types of grippers.

**Unit2:** Industrial robots specifications. Selection based on the Application.

## Module 3:

**Unit 1:** Rotation Matrix, Homogenous TransformationMatrix, transformation matrix problems.

**Unit 2:** Kinematics-Manipulators Kinematics, D-H method of assignment of frames. Direct and Inverse Kinematics for industrial robots.

## Module 4:

**Unit 1:** Trajectory planning: Joint space scheme- Cubic polynomial fit-Obstacle avoidance in operation space-cubic polynomial fit with via point, blending scheme.

**Unit 2:** Types of motion: Slew motion – joint interpolated motion – straight line motion – problems.

## Module 5:

**Unit 1:** Sensors-Internal sensors: Position sensors & Velocity sensors, External sensors: Proximity sensors, Tactile Sensors, & Force or Torque sensors.

**Unit 2:** Programming of Robots and Vision System-Lead through programming methods-Teach pendent- overview of various textual programming languages like VAL etc.

## Text books
1. Industrial Robotics / Groover M P /McGraw Hill
2. Introdu`ction to Robotics / John J. Craig/ Pearson

## Reference books
1. Theory of Applied Robotics / Jazar/Springer.H. Asada and J. J. E. Slotine, ―Robot Analysis and Intelligence‖, Wiley Inter-Science. 1986.

## E- Resources
1. https://rb.gy/dw0rkv https://rb.gy/iayh9d
2. https://nptel.ac.in/courses/112/105/112105249/
3. https://nptel.ac.in/courses/112/101/112101098/

## Course outcomes

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

**CO1:** Apply the basic components of robots

**CO2:** Differentiate types of robots and robot grippers.

**CO3:** Model forward and inverse kinematics of robot manipulators.

**CO4:** Analyze the path planning of the robot.

**CO5:** Program a robot to perform tasks in differential applications.

## 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 | 3 | 3 | - | - | - | - | - | - | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 2 | 3 | 3 | - | - | - | - | - | - | 3 | 3 | 3 |
| **CO3** | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | - | 3 | 3 | 3 |
| **CO4** | 3 | 2 | 2 | 3 | 3 | - | - | - | - | - | - | 3 | 3 | 3 |
| **CO5** | 1 | 2 | 2 | 3 | 3 | - | - | - | - | - | - | 1 | 3 | 3 |
| **Average** | 2.6 | 2 | 2 | 3 | 3 | - | - | - | - | - | - | 2.6 | 3 | 3 |

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

**Pre-Requisites:** Nil

**Course Objectives**

This course will enable students to:

1. To introduce rock types and their physical properties
2. To acquaint with different structures occurring in rocks
3. To get idea about Ground water, and aquifers
4. To get idea about coal formation and its stages.
5. To know about minerals occurring in India.

**Module 1**

Introduction, Definitions, Importance of geology in mining, Types of rocks, Physical properties of rocks.

**Module 2**

Structural Geology: Definition, terminology, and Primary and secondary structures: Bedding, lineation, foliation, cleavage, Strike and dip. Definition of faults, folds and joints and their types, Unconformities, and its kinds.

**Module 3**

Ground Water: Introduction, Hydrological Cycle, origin and occurrence of groundwater, water table. Aquifers: Types of aquifers, confined and unconfined aquifers, perched aquifers.

**Module 4**

Coal: Stages of formation, composition, theories of formation of coal.

**Module 5**

Occurrence and distribution of important metallic mineral deposits in India: Iron, Copper-Lead and Zinc–Manganese– Aluminum–Chromium. Occurrence and distribution of important non-metallic mineral deposits in India: Asbestos–kyanite–Sillimanite.

**Textbooks**

1. Structural Geology – Billings, M.P. Prentice Hall.
2. Engineering geology –by Dr. Chennkeshavulu.

**Reference Books**

1. A Textbook of Geology: Mukherjee P.K., The World Press Pvt. Limited Calcutta.

**Course Outcomes**

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

**CO1 :** Understand about rocks and their properties

**CO2 :** Learn about different structures occurring in rocks

**CO3 :** Understand about ground water, water table and aquifers

**CO4 :** Learn about coal and its formation theories

**CO5 :** Distinguish metallic and non-metallic minerals.

**Course Objective:**

To understand the importance of digital marketing and its applications

1. To understand the basics of Digital Marketing
2. To understand the Channels of Digital Marketing
3. To develop the capability to form Digital Marketing strategy
4. To enable the students to use new media such as Search Engine and Social Networking

**UNIT - I: Understanding Digital Marketing:** Concept, Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends, Practical Exposure towards Social Media Marketing.

**UNIT - II: Channels of Digital Marketing:** Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Audio, Video and Interactive Marketing, Online Public Relations, Mobile Marketing, Migrating from Traditional Channels to Digital Channels, Affiliate Marketing.

**UNIT - II: Marketing in the Digital Era:** Segmentation – Importance of Audience Segmentation, How different segments use Digital Media – Organizational Characteristics, Purchasing Characteristics, Using Digital Media to Reach, Acquisition and Retention of new customers, Digital Media for Customer Loyalty.

**UNIT - III: Digital Marketing Plan:** Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan– Marketing Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget, Writing the Marketing Plan and Implementing the Plan.

**UNIT - IV: Search Engine Marketing and Online Advertising:** Importance of SEM, understanding Web Search – keywords, HTML tags, Inbound Links, Online Advertising vs. Traditional Advertising, Payment Methods of Online Advertising – CPM (Cost-per-Thousand) and CPC (Cost-per-click), Display Ads - choosing a Display Ad Format, Landing Page and its importance.

**UNIT - V: Social Media Marketing:** Understanding Social Media, Social Networking with Face book, LinkedIn, Blogging as a social medium, Micro blogging with Twitter, Social Sharing with YouTube, Social Media for Customer Reach, Acquisition and Retention.

Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

**Course outcomes:**

Upon successfully completing the course, students should be able to:

1. Apply digital marketing in the globalized market
2. Define Channels of Digital Marketing
3. Design and develop Digital marketing plan
4. Understand Search engine marketing
5. Acquainted with Online Advertising

**Suggested Readings:**

1.  Michael Miller, B2B Digital Marketing, 1e, Pearson, 2014.
2.  Vandana Ahuja, Digital marketing, Oxford University Press 2015
3.  Michael R Solomon, Tracy Tuten, Social Media Marketing, Pearson, 1e, 2015. Judy Strauss &Raymond Frost, E-Marketing, Pearson, 2016
4.  Richard Gay, Alan Charles worth and Rita Esen, Online marketing – A customer led approach Oxford University Press 2007.
5.  Arup Varma, Pawan S. Budhwar, Angelo S. De Nisi, Digital Marketing, Wiley, 2016.
6.  David Bain – Digital Marketing in 2017

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | | B. Tech III Year-II Sem | | | |
|---|---|---|---|---|---|---|
| Course Code: L32O3 | **Open Elective-III** **Number Theory & Cryptography** | | L | T | P | D |
| Credits: **3** | | | **3** | **0** | **0** | **0** |

**Pre-Requisites:**

**Module –I  Divisibility Theory And Canonical Decompositions[9L]**

Division  algorithm – Base – b representations – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.

**Module 2: Diophantine Equations And Congruence's     [10L]**

Linear Diophantine equations – Congruence's – Linear Congruence's – Applications: Divisibility tests – Modular exponentiation-Chinese remainder theorem – 2 x 2 linear systems.

**Module 3: Classical theorems and Multiplicative functions    [9L]**

Wilson's theorem – Fermat's little theorem – Euler's theorem – Euler's Phi functions

**Module 4: Classical Encryption Techniques [10L]**

Classical encryption techniques: Symmetric chipper model – Substitution techniques – Transposition techniques – Steganography.

**Module 5: Block chippers public key Encryption  [ 10L ]**

Block chipper principles – block chipper modes and operations – advanced encryption standards (AES) – Public key cryptography – Principles of public key cryptosystem – The RSA algorithm – Elliptic curve arithmetic – Elliptic curve cryptosystem.

**Text Books**

1. Koblitz, N. "Course on Number Theory and Cryptography", Springer Verlag, 1986
2. Menezes, A, et.al. "Handbook of Applied Cryptography", CRC Press, 1996

**Reference Books**

1. Ivan Niven, Herbert S. Zukerman, Hugh L. Montgomery, "An Introduction to the Theory of Numbers".

**E-Resources**

1. https://people.maths.bris.ac.uk/~mazag/nt/lecture1.pdf
2. https://www.diva-portal.org/smash/get/diva2:530204/FULLTEXT01.pdf
3. https://en.wikipedia.org/wiki/Multiplicative_function
4. https://www.slideshare.net/PrachiGulihar/elementary-cryptography
5. https://en.wikipedia.org/wiki/Public-key_cryptography

**Course Outcomes**

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

**CO1**. Ability to think and reason about abstract mathematics

**CO2**. Analyze the vulnerabilities in any computing system and hence be able to design a security solutions

**CO3**. Evaluate security mechanisms using rigorous approaches, including theoretical
**CO4**. Solve problems in elementary number theory
**CO5**. Apply elementary number theory to cryptography

## 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 | 3 | 3 | - | - | - | - | - | - | - | 2 | - | - |
| **CO2** | 3 | 2 | 3 | 3 | - | - | - | - | - | - | - | 2 | - | - |
| **CO3** | 3 | 2 | 3 | 3 | - | - | - | - | - | - | - | 2 | - | - |
| **CO4** | 3 | 2 | 3 | 3 | - | - | - | - | - | - | - | 2 | - | - |
| **CO5** | 3 | 2 | 3 | 3 | - | - | - | - | - | - | - | 2 | - | - |
| **Average** | 3 | 2 | 3 | 3 | - | - | - | - | - | - | - | 2 | - | - |

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

**Pre-Requisites:** Nil

**Module- 1: Introduction to Non-destructive testing [8L]**

Introduction, Objectives of Non-destructive testing, Types of defects – Cracking, Spalling, Staining, Construction and Design defects, Honey combing, Dusting, Blistering, Rain damage.

**Module -2: Methods of Non-destructive Testing [9L]**

Methods of Nondestructive Testing: Liquid penetration method, Dye penetration method, Ultrasonic Inspection method, Pulse Echo method, Radiographic testing Magnetic particle testing, Eddy current Testing.

**Module- 3: Vacuum Technology and Flow Meters [9L]**

**Vacuum Technology:** Definition of vacuum, Degrees of vacuum and their ranges; Review of Kinetic theory of gases; Definitions of particle flux, mono layer formation time, pressure; Elementary gas transport phenomena; Knudsen's and Reynolds' numbers; Throughput, mass flow and conductance.

**Flow meters:** Molar flow, Mass flow.

**Module- 4: Pressure gauges [8L]**

Pressure gauges: Classification, Direct and indirect gauges, Indirect gauges – Pirani gauge, Thermocouple gauge, Ionization gauge, hot cathode gauge, Penning gauge.

**Module-5 : Vacuum Pumps [9L]**

Introduction, Pumping speed, Rotary vane pump, Turbo molecular pump, Diffusion pumps.

**Text Books**

1.B K Pandey, S Chaturvedi, "Engineering Physics", Cengage learning, 1st Edition, 2014.

2. John. F. O'Hanlon, "A User's guide to Vacuum technology", Wiley, 3rd Edition, 2003.

**Reference Books**

1. R Srinivasan, "Physics for Engineers", New Age international, 1st reprint, 2007.

2. R K Gaur and S L Gupta, "Engineering Physics", Dhanpat rai, Reprint, 2006.

3. Krishna Seshan, "Hand Book of Thin film deposition", Noyes, 2nd Edition, 2002.

**E-Resources**

1. http://www.enfm.net/catalog/catalog/enfm-usa.pdf

2. http://web.itu.edu.tr/~arana/ndt.pdf

3.http://www.issp.ac.ru/ebooks/books/open/Nondestructive_Testing_Methods_and_New_Applications.pdf

4.http://nptel.ac.in/courses/114106035/35

5. http://nptel.ac.in/courses/112101004/37

**Course Outcomes**

After completion of this course the student is able to

1. Describe the Types of defects and analyze them.

2. The principles of NDT methods.

3. Analyze Vacuum technology and concepts of flow meters.

4. Apply the basic knowledge on pressure gauges.

5. Understand the concepts of different vacuum pumps.

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | **B. Tech CSE IV Year-I Sem** | | | |
|---|---|---|---|---|---|
| Course Code: **L32O5** | **Chemistry for Engineers** (COMMON TO: All branches) | L | T | P | D |
| Credits: **3** | | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Nil

## Module 1:  Fibres and Rubbers [9]

Fibres-classification-Characteristics of fibres-Preparation and applications of Nylon-6, 6 and Dacron-Fibre reinforced plastics(FRP)-Applications.
Rubbers-Natural rubber and its vulcanization. Elastomers-Buna-S, Butyl rubber and Thiokol rubber.

## Module 2:  Polymers for Electronics[10]

Polymer resists for integrated circuit fabrication, lithography and photolithography, Electron beam, X-ray and ion sensitive resists, Conducting polymers, types, properties and applications, electroluminescence, molecular basis of electrical conductivity, Photonic applications and non-linear optics, optical information
Storage.

## Module 3:  Analysis and Testing of Polymers [8]

Chemical analysis of Polymers: Spectroscopic methods – IR spectroscopy, Raman spectroscopy, NMR spectroscopy, Mass spectroscopy – X-Ray Diffraction analysis. Thermal analysis: Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC), Thermo Gravemetric Analysis (TGA).

## Module 4: Surfactants and Lubricants[10]

Methods of preparation, cleaning mechanism. Critical micelle concentration and its determination. Hydrophobic and hydrophilic interactions. Micelles and reverse micelles. Detergents. Fricohesity of surfactants. Lubricants-physical and chemical properties, types and mechanism of lubrication. Additives of lubricants and freezing points of lubricants.

## Module :  Metals and Alloys [9]

Phase rule and applications to one, two and multi-component systems. Iron-carbon phase diagram. Types of alloys, carbon steel, alloy steel, alloys of Cu, Al, Pb.

## Text Books

1. A Textbook of Engineering Chemistry, by Shashi Chawla
2. Engineering Chemistry, by S. S. Dara

**Reference Books**

1. Engineering Chemistry, by P. C Jain and M. Jain
2. Advanced Polymer Chemistry, by M. Chanda

**E-Resources**

1. https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/nanochemistry.html

2. https://www.sciencedirect.com/book/9780444519566/nanochemistry

3. https://www.researchgate.net/publication/320068992_Introduction_to_Nano-chemistry_and_Nano-materials

4. https://www.kemi.dtu.dk/english/research/organic-inorganic-chemistry/nanochemistry

5. https://www.cambridge.org/core/books/engineering-chemistry/nanochemistry/D6DB35E32E530525DD927E68CED43197

**Course Outcomes**

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

1. Learn the different synthetic methods of the fibres and rubbers.
2. Know the electronic applications of polymers.
3. Acquire the knowledge on various instrumental methods of analysis.
4. Know the use of surfactants and lubricants.
5. Learn the use and applications of alloys.

| AY 2022-23 onwards | **J. B. INSTITUTE OF ENGINEERING AND TECHNOLOGY** **(UGC Autonomous)** | | **B. Tech** **III Year – II Sem** | | | |
|---|---|---|---|---|---|---|
| Course Code: L32O6 | **TECHNICAL COMMUNICATION SKILLS** **(COMMON TO ALL)** | | **L** | **T** | **P** | **D** |
| **Credits: 3** | | | **3** | **0** | **0** | **0** |

**Pre-Requisites: Nil**

**Objectives:**

1. Understand the role of language as a communication
2. Employ the role of presentation skills in public speaking
3. Know the importance of body language
4. Examine the role of group discussion for getting jobs
5. Understand the importance of interview skills for getting jobs

**Module -I Language as a Communication**

Introduction-definition-the process of communication-types of communication-barriers of communication; language and communication-properties of language.

**Module -II Presentation Skills**

Nature and importance of oral presentation-planning the presentation-preparing the presentation-organizing the presentation-rehearsing the presentation and checklist for making oral presentation

**Module -III Body Language**

Introduction-definition-eye contact- facial expressions-gesture and posture.

**Module -IV Group Discussion**

Nature of GD- Characteristics and Strategies of GD-Techniques for Individual Contribution-Group Interaction Strategies.

**Module -V Interview Skills**

The Interview Process-Characteristics of Interview-Pre-interview preparation Techniques-interview questions-FAQ- Projecting a Positive Image and Alternative Interview Format.

**References:**

1) Raman, Meenakshi and Sangeeta Sharma. Technical Communication-Principles and Practice. Third Edition, New Delhi: UP., 2015.
2) Rizvi, M Ashraf. Effective Technical-Communication. New Delhi: Tata McGraw-Hill., 2005.

**Course outcomes:**

1. Use the language skills in order to better communication
2. Learn the presentation skills and use them in conferences and seminars
3. Identify the role of presentation skills in expressing our feelings and emotions
4. Understand the role of group discussion for getting jobs
5. Know the importance of interview skills for getting jobs

## CO-PO/PSO Mapping

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO-PO/PSO Mapping Chart** (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak | | | | | | | | | | | | | | |
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 3 | .. | 3 | .. | .. |
| CO2 | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 3 | .. | 3 | .. | .. |
| CO3 | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 3 | .. | 3 | .. | .. |
| CO4 | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 3 | .. | 3 | .. | .. |
| CO5 | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 3 | .. | 3 | .. | .. |
| **Total** | .. | .. | .. | .. | .. | .. | .. | .. | 2 | 3 | .. | 3 | .. | .. |

# OPEN ELECTIVE-IV

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | **B. Tech CE IV Year-I Sem** | | | |
|---|---|---|---|---|---|
| Course Code: **L41OA** | **ENVIRONMENTAL IMPACT ASSESSMENT** (OE-IV) | L | T | P | D |
| Credits: 3 | | **3** | **0** | **0** | **0** |

**Pre-Requisites:** Environmental Science.

## Module 1:

**Unit-1:** Initial Environmental examination –Factors affecting EIA – Need for EnvironmentalImpact Assessment (EIA), Rapid and Comprehensive EIA, Environmental Impact statement (EIS)

– EIA capability and limitations – Legal provisions on EIA – stages of EIA.

## Module 2:

**Unit-1:** Role of NEPA in EIA, CEQ, Environmental documents. EIA/ EIS& FONSI relationship, processing of EIA/EIS, Environmental attributes.

**Methodologies**: Criteria to be considered for the selection of EIA methodologies, Adhoc, overlays, Check lists – Matrices – Networks – Cost-benefit analysis with their advantages and limitations.

## Module 3:

**Unit-1:** EIA guidelines for Development Projects, Prediction and Assessment – Assessment of Impact on land, water, air, and noise. Social and cultural activities and on flora and fauna – mathematical models – public participation, Forest act 1980, Wild life Protection Act-1972, The water (Prevention and control) Act-1974

## Module 4:

### Unit-1: Environment management plan:

Plan for mitigation of adverse impact on Environment – Options for mitigation of impact on water, air, land and on flora and fauna – Addressing the issues related to project affected people. Post project monitoring. ISO 9000, 14000 & 18000.

## Module 5:

### Unit-1:

EIA for Water resource developmental projects, Highway projects: Nuclear Power plant projects,Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities.

## Text Books

1. "Environmental Impact Assessment" by S.R. Khandeshwar N.S. Raman, A.R. Gajbhiye, I k international house publishing, pvt ltd. 1st addition Sep 2019.
2. "Environmental Impact Assessment" by Barthwell, R. R. New Age InternationalPublications. 3rd addition Oct 2017.

## Reference Books

1. "Environmental Impact Analysis" by Jain R.K.-Van Nostrand Reinhold Co, H K E S international publication, 3rd addition oct 2014.
2. "Environment Impact Assessment" by Anjaneyulu, B S Publication, 2nd addition Jan 2010

## Web Resources

1. https://nptel.ac.in/courses/120/108/120108004/

## Course Outcomes

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

1. **Explain** the stages and need for environmental impact assessment.
2. **Discuss** different methodologies for environmental impact prediction and assessment.
3. **Evaluate** the environmental management plans.
4. **Solve** the problems associated with adverse impact on environment.
5. **Apply** the knowledge of EIA on different construction projects

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | - | 2 | - | - | - | 1 | 2 | 3 | - | - | - | - | 2 | 1 |
| CO2 | - | - | - | - | - | 2 | 3 | 1 | - | - | - | - | 1 | 1 |
| CO3 | - | - | - | - | - | 2 | 2 | 3 | - | - | - | - | 2 | 1 |
| CO4 | - | 2 | - | - | - | 1 | 2 | 3 | - | - | - | - | 1 | 3 |
| CO5 | - | - | - | - | - | 1 | 3 | 2 | - | - | - | - | 2 | 2 |
| Average | - | 0.8 | - | - | - | 1.4 | 2.4 | 2.4 | - | - | - | - | 1.6 | 1.6 |

*CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation) 3 – Strong; 2 – Medium; 1 - Weak*

**Pre-Requisites: NIL**

**Course Objectives:**

The students should be able to

1. Acquire programming skills in core Python.
2. Apply the Python programming language operations, control structures
3. Develop the ability to use built-in data types
4. Develop the skill of creating functions, writing data to files
5. Acquire Object Oriented Skills in Python

## Module 1:   Introduction

**Unit-I: History**

Python Introduction, History of Python, Introduction to Python Interpreter and program execution, Python Installation Process in Windows and Linux, Introduction to anaconda.

**Unit-II:  Variables**

Python IDE, python variable declaration, Keywords, Indents in Python, Python input/output operations.

## Module 2:  Operators, Conditional Statements, Loops

**Unit-I: Operators**

Arithmetic Operators, Comparison Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Ternary Operator, Operator precedence.

**Unit-II: Conditional Statements, Loops**

Conditional Statements (If, If-else, If-elif-else, Nested-if etc.) and loop control statements (for, while, Nested loops, Break, Continue, Pass statements)

## Module 3: Built-in Data types

**Unit-I: Strings, Lists**

Strings Creating, initializing and accessing the elements; String operators, String functions and methods. Lists: Concept of mutable lists, creating, initializing and accessing the elements, traversing, appending, updating and deleting elements

**Unit-II: Tuple, Set, Dictionary**

Tuples creating, initializing and accessing the elements in a tuple. Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, dictionary operations, Dictionary functions and methods.

## Module 4: Functions and Files

**Unit-I: Functions**

Introduction to functions, Function definition and calling, Function parameters, Default argument function, Variable argument function, in built functions in python, Scope of variable in python.

**Unit-II: Files**

Concept of Files, File opening in various modes, closing of a file. Reading from a file, writing onto a file, some important File handling functions.

## Module 5: Object oriented Programming

### Unit-I: Programming types

Programming types, Procedure-oriented programming, Object Oriented Programming.

### Unit-II:

Accessing Databases using Python.

## Text Books

1. Python for Everybody: Exploring Data in Python 3 by Charles Severance

## Reference Books

1. Programming in Python 3 - A complete Introduction to the Python Language Second Edition, Mark Summerfield, Addison-Wesley 2010
2. Object-Oriented Programming in Python, Michael H, Goldwasser, David Letscher, Pearson Prentice Hall, 2008.
3. Programming Python- 4 th Edition, Mark Lutz, O'Reilly, 2011.

## E-Resources

1. https://www.youtube.com/watch?v=YYXdXT2l-Gg&list=PL-osiE80TeTskrapNbzXhwoFUiLCjGgY7
2. https://docs.python.org/3/tutorial/
3. https://www.programiz.com/python-programming
4. https://www.w3schools.com/python/

## Course Outcomes

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

**CO1**. Choose the right data representation formats based on the requirements of the problem.
**CO2.** Identify tasks and write programs in python, to solve the task.
**CO3**. Use the comparisons and limitations of the various built-in data types and choose the right one.
**CO4**. Identify and write the functions, programs required for accessing files.
**CO5**. Demonstrates how to achieve reusability using inheritance, interfaces.

**Pre-Requisites:**

1. Probability Statistics, linear algebra. Machine learning .

**Course Objectives:**

**The Student will:**

1. Get introduced to various learning techniques of machine learning and understand differences between machine learning and deep learning
2. Understand and analyse optimization techniques and improvements in learning methods
3. Appreciate, understand and apply neural networks as tools for complete learning problems
4. Investigate and deploy/club multi-layer neural networks for learning related to images, text and speech sequences.
5. Appreciate, understand and implement Deep learning in real world practical problems

**Module 1:**

**Introduction to Deep Learning**

Introduction to Deep Learning, Brief History of Deep Learning, AI, Machine Learning and Deep Learning, Statistical Learning,

Bayesian Learning, Decision Surfaces, Success stories of Deep Learning

**Module 2:**

**Linear Classifiers**

Linear Classifiers, Linear Machines with Hinge Loss, Optimization Techniques, Gradient Descent, Batch Optimization,

Revisiting Gradient Descent, Momentum Optimizer, RMSProp, Adam.

**Module 3:**

**Neural Network**

Introduction to Neural Network, Multilayer Perceptron, Back Propagation Learning, Unsupervised Learning with Deep Network, Autoencoders, Convolutional Neural Network, Building blocks of CNN, Transfer Learning, LSTM Networks.

**Module 4:**

**Deep Neural Net**

Effective training in Deep Net- early stopping, Dropout, Batch Normalization, Instance Normalization, Group Normalization,

Recent Trends in Deep Learning Architectures, Residual Network, Skip Connection Network, Fully Connected CNN

**Module 5:**

**Applications**

Detection & Segmentation problem definition, challenges, Evaluation, Datasets and Localization by regression, Detection as classification

Region proposals, RCNN and YOLO architectures, fully convolutional segmentations, Mask-RCNNs.

**Text Books:**

1. Deep Learning- Ian Goodfelllow, YoshuaBenjio, Aaron Courville, The MIT Press
2. Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

   **Reference Books:**

1. Deep Learning: A Practitioner's Approach by Josh Patterson & Adam Gibson, OReilly Press
2. Python Deep Learning: Exploring deep learning techniques and neural network architectures with PyTorch, Keras, and TensorFlow, 2nd Edition by Ivan Vasilev, Pakt Publication.

**E - Resources:**

1. https://nptel.ac.in/courses/106/105/106105215/
2. https://www.slideshare.net/LuMa921/deep-learning-a-visual-introduction
3. https://yiqiaoyin.files.wordpress.com/2018/02/deep-learning-notes.pdf

   **Course Outcomes:**

   **The student will be able to:**

1. Identify tools of machine learning and deep learning, appropriate to any problems
2. Apply optimization techniques to improve the quality of various learning solutions.
3. Apply and investigate, neural network for complete learning problems.
4. Implement deep learning methods in the area of multidimensional and sequential inputs.
5. Investigate the scope of implementation of various deep learning techniques in any real world problem

## Course Objectives:

1. The purpose of this course is to provide the students with the knowledge of Big data Analytics principles and techniques.
2. This course is also designed to give an exposure of the frontiers of Big data Analytics

## MODULE-I: Introduction to Big Data and Big Data Analytics

### Unit 1:

Introduction to Big Data: Big Data and its Importance, Four V's of Big Data,Structring Big Data

### Unit 2:

Drivers for Big Data, Introduction to Big Data Analytics, Classification of Analytics, Big Data Analytics applications

## MODULE- II: Big Data Technologies Unit 1:

Big Data Technologies: Hadoop's Parallel World, Data discovery, Open source technology for Big Data Analytics, cloud and Big Data.

### Unit 2:

Predictive Analytics, Mobile Business Intelligence and Big Data

### MODULE- III: Introduction to Hadoop and Map Reduce
### Unit 1:

Introduction Hadoop: Big Data, Apache Hadoop & Hadoop Eco System, Moving Data in and out of Hadoop.

### Unit 2:

Map Reduce, understanding inputs and outputs of Map Reduce - Data Serialization.

## MODULE- IV:Hadoop Architecture & HDFS Architecture

### Unit 1:

Hadoop Architecture: Hadoop: RDBMS Vs Hadoop, Hadoop Overview, Hadoop distributors, HDFS,HDFS Daemons, Anatomy of File Write and Read., Name Node, Secondary Name Node, and DataNode.

### Unit 2:

HDFS Architecture, Hadoop Configuration, Map Reduce Framework, Role of HBase in Big Data processing, HIVE, PIG.

## MODULE- V: Data Analytics & Social Media Analytics
### Unit 1:

Data Analytics with R Machine Learning: Introduction, Supervised Learning, Unsupervised Learning.

## Unit 2:

Collaborative Filtering, Social Media Analytics, Mobile Analytics, Big Data Analytics with Big R

### TEXT BOOKS:

1. Big Data Analytics, Seema Acharya, Subhasini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O"Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

### REFERENCE BOOKS:

1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013)
2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media (2013), Oracle press.
3. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.
4. Understanding Big data, Chris Eaton, Dirk deroos et al. McGraw Hill, 2012.
5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

### Courses Outcomes:

1. Ability to explain the foundations, definitions, and challenges of Big Data and various Analytical tools.
2. Ability to program using HADOOP and Map reduce, NOSQL
3. Ability to understand the importance of Big Data in social media and Mining.

**Pre-Requisites: NIL**

**Module 1: [10L]**

**Unit-I: [6L]**

Audio Fundamentals and Devices: Basic characteristics of sound signal: level and loudness, pitch, frequency response, fidelity and linearity, Reverberation. Audio level metering, decibel level in acoustic measurement. Microphone: working principle, sensitivity, nature of response, directional characteristics.

**Unit-II: [4L]**

Types: carbon, condenser, crystal, electrets, tie- clip, wireless. Loudspeaker: working principle, characteristic impedance, watt capacity. Types: electrostatic, dynamic, permanent magnet, woofers, and tweeters. Sound recording: Optical recording, stereophony and multichannel sound, MP3 standard.

**Module 2: [8L]**

**Unit-I: [4L]**Audio systems: CD player, home theatre sound system, surround sound. Digital console: block diagram, working principle, applications.

**Unit-II: [4L]**FM tuner: concepts of digital tuning, ICs used in FM tuner TDA 7021T. PA address system: planning, speaker impedance matching, Characteristics, power amplifier, Specification.

**Module 3: [8L]**

**Unit-I: [4L]**Television Systems: Monochrome TV standards, scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution. Composite video signal: horizontal and vertical sync details, scanning sequence.

**Unit-II: [4L]**Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance. Different types of TV camera. Transmission standards: PAL system, channel bandwidth

**Module 4: [10L]**

**Unit-I: [5L]**Television Receivers and Video Systems: PAL-D colour TV receiver, block diagram, Precision IN Line colour picture tube. Digital TVs: - LCD, LED, PLASMA, HDTV, 3-D TV, projection TV, DTH receiver.

**Unit-II: [5L]**Video interface: Composite, Component, Separate Video, Digital Video, SDI, HDMI Multimedia Interface), Digital Video Interface. CD and DVD player: working principles, Interfaces.

**Module 5: [9L]**

**Unit-I: [5L]**Home / Office Appliances: FAX and Photocopier. Microwave Oven: types, single chip controllers, wiring and safety instructions, technical specifications. Washing Machine: wiring diagram, electronic controller for washing machine, technical specifications, types of washing machine, fuzzy logic.

**Unit-II:[4L]**Air conditioner and Refrigerators: Components features, applications, and technical specification. Digital camera and cam coder: - pick up devices - picture processing - picture storage.

**Textbooks**

4. Consumer Electronics, Bali S.P., Pearson Education India,2010.
5. Audio video systems: principle practices & troubleshooting, Bali R and Bali S.P., Khanna Book Publishing Co. (P) Ltd., 2010Delhi, India.

**Reference Books**

6. Intellectual Property in Consumer Electronics, Software and Technology Startups, Springer Nature; 2014th edition (24 September 2013),ISBN-10:9781461479116.
7. Consumer Electronics, B.R. Gupta , V. Singhal, S.K. Kataria & Sons; 2013th edition.

**E-Resources**

1. https://www.allaboutcircuits.com/videos/category/consumer-electronics/
2. https://www.youtube.com/watch?v=IttXKAGl6zE

**Course Outcomes**

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

**CO1. Learn** how a Consumer Product is developed.

**CO2**. **Analyze** how to simulate and test that designs.

**CO3**. **Apply** in-depth study of systems and the use of those.

**CO4**. **Understand** concept of Audio Systems.

**CO5**. **Develop**Television Receivers & Video Systems.

**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 | 3 | - | - | - | - | - | - | - | 2 | - |
| **CO2** | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | - |
| **CO3** | 3 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | - |
| **CO4** | - | - | - | - | - | - | - | - | - | - | - | - | 2 | - |
| **CO5** | 2 | - | 3 | 3 | - | - | - | - | - | - | - | - | 2 | - |
| **Average** | 2.3 | 2 | 2.5 | 2.5 | 3 | - | - | - | - | - | - | - | 2 | **-** |

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

**Pre-Requisites:** Nil

**Course Objectives:**

Students will learn to

1. Understand the basic concepts of embedded systems and 8051 microcontrollers.

2. Compare and contrast the basics of assembly programming language.

3. Identify the unique characteristics of real-time systems

4. Analyze the general structure of a real-time system and define the unique design problems and challenges of real-time systems.

5. Acquaint the embedded software development tools and various advanced architectures.

**Module 1:**

**Unit-I: Embedded Computing**

Introduction, complex systems and microprocessor, the embedded system design process, formalisms for system design, design examples

**Unit-II: The 8051 Architecture**

Introduction, 8051 micro controller hardware, input/output ports and circuits, external memory, counter and timers, serial data input/output, interrupts.

**Module 2:**

**Unit-I: Basic Assembly Language Programming Concepts**

The assembly language programming process, programming tools and techniques, programming the 8051.

**Unit-II:**

Data transfer and logical instructions, arithmetic operations, decimal arithmetic, jump and call instructions.

**Module 3:**

**Unit-I: Introduction to Real-Time Operating Systems**

Tasks and task states, tasks and data, semaphores, and shared data; message queues, mailboxes and pipes, timer functions, events, memory management, interrupt routines in an RTOS environment.

**Unit-II: Basic Design Using a Real-Time Operating System**

Principles, semaphores and queues, hard real-time scheduling considerations, saving memory and power, an example RTOS like uC-OS (open source).

**Module 4:**

**Unit-I: Embedded Software Development Tools**

Host and target machines, linker/locators for embedded software, getting embedded software into the target system

**Unit-II: Debugging Techniques**

Testing on host machine, using laboratory tools, an example system.

**Module 5:**

**Unit-I: Introduction to advanced Architectures**

ARM and SHARC, processor and memory organization and instruction level parallelism.

**Unit-II:** Networked embedded systems: bus protocols, I2C bus and CAN bus; internet-enabled systems, design example-elevator controller.

**Text Books**

1. Wayne Wolf (2008), Computers as Components-principles of embedded computer system design, Elseveir, New Delhi, India.
2. Kenneth J. Ayala (2008), The 8051 Microcontroller, 3rd edition, Cengage Learning, India.

**Reference Books**

1. David E. Simon (1999), An Embedded Software Primer, Pearson Education, India.
2. Jean J. Labrosse (2000), Embedding System Building Blocks, 2nd edition, CMP publishers, USA.
3. Raj Kamal (2004), Embedded Systems, Tata McGraw hill, India.

**E-Resources**

1. https://nptel.ac.in/courses/108/102/108102045/
2. https://www.edx.org/course/utaustinx/utaustinx-ut-6-02x-embedded-systems-4806

**Course Outcomes**

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

**CO1**. Program an embedded system.

**CO2**. Analyze Interfacing with keyboard, A/D & D/A conversions, serial data Communication, LCD and LED display.

**CO3**. Illustrate Tasks, Semaphores, Message queues, pipes, Timer functions.

**CO4**. Design embedded systems and real-time systems.

**CO5**. Compare and contrast ARM, SHARC, internet enabled systems.

**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 | 1 | 2 | - | - | - | - | - | 1 | - | 2 | 2 | 2 | - |
| **CO2** | 2 | 2 | 2 | - | - | - | - | - | 2 | - | 2 | 2 | 3 | 1 |
| **CO3** | 2 | 2 | - | - | - | - | - | - | 2 | - | - | 2 | 3 | 1 |
| **CO4** | 1 | 3 | - | - | - | - | - | - | 2 | - | - | 2 | 3 | 1 |
| **CO5** | 2 | 1 | - | - | - | - | - | - | 2 | - | 2 | 2 | 2 | 1 |
| **Average** | 1.8 | 1.8 | 2 | - | - | - | - | - | 1.8 | - | 2 | 2 | 2.6 | 1 |

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

**Pre-Requisites:** Basic Electrical and Electronics Engineering

## Module 1: PERMANENT MAGNET BRUSHLESS DC MOTORS [8L]

Fundamentals of permanent magnets – types - principle of operation- magnetic circuit analysis - EMF and torque equations, Characteristics and control.

## Module 2: PERMANENT MAGNET SYNCHRONOUS MOTORS [12L]

Principle of operation – EMF and torque equations - Phasor diagram - Power controllers – performance characteristics – Digital controllers – Constructional features, operating principle and characteristics of synchronous reluctance motor.

## Module 3: SWITCHED RELUCTANCE MOTORS [10L]

Constructional features – Principle of operation - Torque prediction – performance Characteristics-Power controllers – Control of SRM drive - Sensor less operation of SRM – Applications.

## Module 4: STEPPER MOTORS [10L]

Constructional features –Principle of operation –Types – Torque equation – Linear and Nonlinear analysis – Characteristics – Drive circuits – Closed loop control – Applications.

## Module 5: OTHER SPECIAL ELECTRICAL MACHINES [8L]

Principle of operation and characteristics of Hysteresis motor – AC series motors – Linear inductionmotor – Applications.

### Text Books

1. T.J.E. Miller, Brushless magnet and Reluctance motor drives, Claredon press, London, 1989.
2. R.Krishnan, Switched Reluctance motor drives, CRC press, 2001.
3. T.Kenjo, Stepping motors and their microprocessor controls, Oxford University press, New Delhi, 2000.
4. K. Venkataratnam, Special Electrical Machines, Universities Press, 2014.

### Reference Books

1. T.Kenjo and S.Nagamori, Permanent magnet and Brushless DC motors, Clarendon press, London, 1988.
2. R.Krishnan, Electric motor drives, Prentice hall of India, 2002.
3. D.P.Kothari and I.J.Nagrath, Electric machines, Tata Mc Graw hill publishing company, New Delhi,Third Edition, 2004
4. Irving L.Kosow, Electric Machinery and Transformers, Pearson Education, Second Edition, 2007

### E-Resources

1. https://nptel.ac.in/courses/108/102/108102156/
2. https://www.academia.edu/9885014/SPECIAL_ELECTRICAL_MACHINES_NPTEL_NOTES
3. https://easyengineering.net/ee6703-special-electrical-machines/

## Course Outcomes

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

**CO 1.** Analyze given magnetic circuit and understand operation, characteristics and control of PMBLDC motor.

**CO 2.** Understand the construction, operation performance characteristics of PMSM and its power controllers.

**CO 3.** Understand the construction, operation and control of SRM drive and its power controllers.

**CO 4.** Understand the construction, operation, characteristics and control of stepper motor.

**CO 5.** Understand the operation & characteristics of other special electrical machines.

## 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 | 1 | 3 | 3 | 3 | - | - | - | - | - | - | - | - | 3 | 3 |
| CO2 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| CO3 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| CO4 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| CO5 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | - | - |
| Average | 1.8 | 2.2 | 3 | 3 | - | - | - | - | - | - | - | - | 3 | 3 |

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

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | **B. Tech IT IV Year-I Sem** | | | |
|---|---|---|---|---|---|
| Course Code: L41OH | **Object Oriented Analysis and Design** **(OPEN ELECTIVE-IV)** | L | T | P | D |
| Credits: **3** | | **3** | **0** | **0** | **0** |

**UNIT - I Introduction to UML**:

Importance of modeling, principles of modelling, object-oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle.

**UNIT - II Basic Structural Modeling:**

Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

**UNIT - III Class & Object Diagrams:**

Terms, concepts, modeling techniques for Class & Object Diagrams.

**UNIT - IV Basic Behavioral Modeling-I**:

Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams

**UNIT - V Advanced Behavioral Modeling**:

Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

**TEXT BOOK**

1. Grady Booch, James Rumbaugh, Ivar Jacobson : The Unified Modeling Language User Guide, Pearson Education**.**

**Course Outcomes**: After the completion of the course, students should be able to:

**CO 1**: Select the basic elements of modeling such as Things, Relationships and Diagrams depending on the views of UML Architecture and SDLC.

**CO 2**. Apply basic and Advanced Structural Modeling Concepts for designing real time applications.

**CO 3**. Design Class and Object Diagrams that represent Static Aspects of a Software System.

**CO 4**. Analyze Dynamic Aspects of a Software System using Use Case, Interaction and Activity Diagrams.

**CO 5**. Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspects and Runtime environment of Software Systems.

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | B. Tech IV Year-I Sem | | | |
|---|---|---|---|---|---|
| Course Code: **L41OI** | **BASICS OF MINE ENVIRONMENT (OPEN ELECTIVE – IV)** | 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 atmospheric, mine air & their limitations
2. To acquaint with spontaneous heating and explosions in coal mines
3. To get idea about sources of dust, and its control in mines
4. To get idea about miners' diseases & lighting in mines
5. To know about reclamation of mines, impact of mining on environment & sustainable mining

**Module 1**

Atmosphere and mine air composition. Origin of gases, properties, limitations of gases in underground mines

**Module 2**

Spontaneous Combustion: Factors, control measures.

Explosions: Causes of firedamp explosion, preventive measures against firedamp explosion.

**Module 3**

Dust: Sources in underground and opencast mines, standards, and control measures.

**Module 4**

Miner's diseases, Lighting standards in underground and opencast mines**.**

**Module 5**

Reclamation, plantation of surface mines, Impact of mining on environment & sustainable mining.

**Textbooks**

1. Elements of Mining Technology (VOL-2) – by D.J. Deshmukh.
2. Surface Mining – by S.K. Das.

**Reference Books**

1. Mine Ventilation – by G.B. Mishra.

**Course Outcomes**

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

**CO1**   Learn about atmospheric and mine air
**CO2**   Learn about spontaneous combustion and explosion in coal mines
**CO3**   Understand about dust sources and its control in mines
**CO4**   Learn about miners' diseases, mine lighting, and its standards
**CO5**   Learn about reclamation of mines, impacts of mining on environment and sustainable mining

**Course Objective:** To understand the importance of Rural Marketing, Rural Environment, Problems in Rural Marketing in India and Strategies to be adopted by the corporate.

### UNIT-I:

**Introduction:** Meaning - Evolution – Nature and Characteristics of Rural Market – Understanding theIndian Rural Economy –Rural Marketing Models – Rural Marketing Vs Urban Marketing – Parametersdifferentiating Urban & Rural Market - Differences in consumer behavior in Rural and Urban market.

### UNIT-II:

**Rural Market Research:** Sources of Information- Factors influencing rural consumers during purchase of products – Rural consumer Life style –Approaches and Tools of Marketing Research - Rural Business Research- Evolution of Rural Marketing Research – Sources and methods of data collection , data collection approaches in rural areas, data collection tools for rural market. Limitation and challenges in rural marketing research, role of rural marketing consulting agencies

### UNIT-III:

**Rural Marketing Mix:** Rural Marketing Mix – Additional Ps in Rural Marketing – 4As of Rural Marketing Mix – New Product Development for Rural Market – Rural Market Product Life Cycle – Objectives behind new product launch – New Product development process

### UNIT-IV:

**Rural Market Brand & Channel Management:** Brand Loyalty in Rural Market – Regional Brands VsNational Brands – Channel Management – Indian Rural Retail Market – Rural Retail Channel Management – Strategies of Rural Retail Channel Management.

### UNIT-V:

**Applications and Innovations**: Marketing of Consumer products, services, social marketing, agricultural marketing, rural industry products- Innovation for Rural Market – Marketing Strategies – e-Rural Marketing – Agricultural Co – operative Marketing – Rural Market Mapping – Corporate Social Responsibility – Organized Rural Marketing – IT for Rural Development – e-Governance for Rural India.

### TEXT BOOKS:

1. C.S.G. Krishnamacharyulu, Lalitha Ramakrishnan, Rural Marketing: Text and Cases, Pearson Education, 2009.
2. Pradeep Kashyap, Rural Marketing, 3e Perason Education, 2016.
3. Balram Dogra & Karminder Ghuman, Rural Marketing, TMH, 2009.
4. Sanal Kumar Velayudhan, Rural Marketing, 2e Sage publications, 2012.
5. T P Gopalaswamy, Rural Marketing, Environment, problems, and strategies, 3e Vikas Publications, 2016.

# OPEN ELECTIVE-V

**Pre-requisite:** Green buildings

Module 1:

## Unit 1: Energy Scenarios:

Energy Conservation-Energy Audit-Energy Consumption-Energy Security-Energy Strategy-CleanDevelopment Mechanism.

## Unit 2: Types of Energy Audits and Energy-Audit Methodology:

Definition of Energy Audit-Place of Audit-Energy- Audit Methodology-Financial Analysis-Sensitivity Analysis-Project Financing Options-Energy Monitoring and Training

Module 2:

## Unit 1: Environmental Audit:

Environmental Audit; Introduction-Necessity-Norms. Types: Objectives-Bases types; Liabilities Audit-Management Audit-Activities Audit-Client drive and types; regulatory external audits- independent external audit-internal environmental audit -third party audit.

## Unit 2: Environmental Impact Assessment:

Introduction-EIA regulations-Steps in Environmental impact assessment process benefits of EIA- limitations of EIA-Environmental Clearance for Civil Engineering Projects.

Module 3:

## Unit 1: Energy Sources:

Renewable and Non-renewable sources of energy - Coal, Petroleum, Nuclear, Wind, Solar, Hydro,Geothermal sources, potential of these sources, hazards

## Unit 2: Energy Conservation:

Introduction-Specific objectives-need of energy conservation-LEED India rating system andEnergy Efficiency.

Module 4:

## Unit 1: Green Building:

Introduction-Definition-Benefits-Principles; Planning concept of Green Building- Salient features of Green Building-Environmental Design-Strategies for Building Construction-Process; Improvement in Environmental Quality in Civil Structure. Materials; Bamboo, Rice Husk Ash, Concrete, Plastic Bricks-Reuse of waste materials- Plastic, Rubber, News Paper, Wood, Non- Toxic paint, Green roofing.

Module 5:

## Unit 1: Rating system for Green Building:

Leadership in Energy and Environmental Design (LEED) Criteria-Indian Green Building Council (IGBC) Green Rating-Green Rating for Integrated Habitat Assessment (GRIHA)

criteria-HVAC unit in Green Building-Certification Programs (including GEM and ECBC Certifications).

## TEXT BOOKS:

1. "Sustainable construction: Green Building design and delivery" by Kibert, C.J(John Wiley Hoboken, New Jersey).
2. "Non-Conventional Energy resources" by Chauhan, D S Sreevasthava, S K (New Age International Publishers, New Delhi).
3. "Alternative Building Materials and Technologies" by Jagadeesh, K S, Reddy Venkatta Rama, Nanjunda Rao K S (New Age International Publishers, New Delhi).
4. "Green Buildings" by Gevorkian (McGraw hill publication).

## REFERENCES:

1. "Handbook of Green Building Design and Construction" by Sam Kubba (Butterworth-Heinemann).
2. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design.
3. Energy Conservation Building Code 2017.

## E-Resources:

1. https://nptel.ac.in/noc/courses/noc18/SEM1/noc18-ce06
2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ce40

## Course outcomes:

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

1. Differentiate and select best of various energy scenarios and energy auditing methodology
2. Identify various Renewable and Non-renewable sources of energy.
3. Justify others to use the waste materials efficiently and effectively.
4. Explain the application of design guidelines of Green Building considering the Energy Conservation Measures.
5. Discuss the building codes, relevant legislation governing the consumption of resources

| Course Outcomes (COs) | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 2 | 1 | 1 | - | 1 | 2 | - | - | - | - | - | 1 | 1 |
| CO2 | 1 | 2 | 1 | 1 | - | 2 | 2 | - | - | - | - | - | 1 | - |
| CO3 | 2 | 1 | 2 | 1 | - | 1 | 2 | - | - | - | - | - | - | 1 |
| CO4 | 1 | 1 | 1 | 1 | - | 2 | 2 | - | - | - | - | - | 1 | 1 |
| CO5 | - | 1 | 1 | 1 | - | 1 | 2 | - | - | - | - | - | 1 | - |
| Average | 1 | 1.4 | 1.2 | 1 | - | 1.4 | 2 | - | - | - | - | - | 0.8 | 0.6 |

**CO-PO/PSO Mapping Chart**
**(3/2/1 indicates strength of correlation)**
**3 – Strong; 2 – Medium; 1 – Weak**

Program Outcomes (POs) | Program Specific Outcomes*

**Pre-Requisites:NIL**

**Course Objectives:**

The students should be able to

1. Acquire programming skills in core Python.
2. Apply the Python programming language operations, control structures
3. Develop the ability to use built-in data types
4. Develop the skill of creating functions, writing data to files
5. Acquire Object Oriented Skills in Python

## Module 1:   Introduction

### Unit-I: History

Python Introduction, History of Python, Introduction to Python Interpreter and program execution, Python Installation Process in Windows and Linux, Introduction to anaconda.

### Unit-II:  Variables

Python IDE, python variable declaration, Keywords, Indents in Python, Python input/output operations.

## Module 2:  Operators, Conditional Statements, Loops

### Unit-I: Operators

Arithmetic Operators, Comparison Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Ternary Operator, Operator precedence.

### Unit-II: Conditional Statements, Loops

Conditional Statements (If, If-else, If-elif-else, Nested-if etc.) and loop control statements (for, while, Nested loops, Break, Continue, Pass statements)

## Module 3: Built-in Data types

### Unit-I: Strings, Lists

Strings Creating, initializing and accessing the elements; String operators, String functions and methods. Lists: Concept of mutable lists, creating, initializing and accessing the elements, traversing, appending, updating and deleting elements

### Unit-II: Tuple, Set, Dictionary

Tuples creating, initializing and accessing the elements in a tuple. Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, dictionary operations, Dictionary functions and methods.

## Module 4: Functions and Files

### Unit-I: Functions

Introduction to functions, Function definition and calling, Function parameters, Default argument function, Variable argument function, in built functions in python, Scope of variable in python.

### Unit-II: Files

Concept of Files, File opening in various modes, closing of a file. Reading from a file, writing onto a file, some important File handling functions.

## Module 5: Object oriented Programming

**Unit-I: Programming types**

Programming types, Procedure-oriented programming, Object Oriented Programming.

**Unit-II:**

Accessing Databases using Python.

**Text Books**

1. Python for Everybody: Exploring Data in Python 3 by Charles Severance

**Reference Books**

1. Programming in Python 3 - A complete Introduction to the Python Language Second Edition, Mark Summerfield, Addison-Wesley 2010
2. Object-Oriented Programming in Python, Michael H, Goldwasser, David Letscher, Pearson Prentice Hall, 2008.
3. Programming Python- 4 th Edition, Mark Lutz, O'Reilly, 2011.

**E-Resources**

1. https://www.youtube.com/watch?v=YYXdXT2l-Gg&list=PL-osiE80TeTskrapNbzXhwoFUiLCjGgY7
2. https://docs.python.org/3/tutorial/
3. https://www.programiz.com/python-programming
4. https://www.w3schools.com/python/

**Course Outcomes**

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

**CO1**. Choose the right data representation formats based on the requirements of the problem.

**CO2.** Identify tasks and write programs in python, to solve the task.

**CO3**. Use the comparisons and limitations of the various built-in data types and choose the right one.

**CO4**. Identify and write the functions, programs required for accessing files.

**CO5**. Demonstrates how to achieve reusability using inheritance, interfaces.

**Pre-Requisites:**

1. Math: Linear Algebra, Calculus, Probability and Statistics
2. Data Structures
3. Machine Learning
4. Deep Learning

**Course objectives:**

**The student will:**

1. Understand the difference between generative and discriminative models.
2. Identify problems that GANs can solve.
3. Understand the roles of the generator and discriminator in a GAN system.
4. Understand the advantages and disadvantages of common GAN loss functions.
5. Identify possible solutions to common problems with GAN training.

**Module 1:**

**Introduction to GANs:-**

What are GANs?- How do GANs work?- GAN Training- Reaching Equilibrium- Applications of GANs

**Generative Modelling with encoders:-**

Introduction to Generative Modelling- Working of Auto Encoders at high level- Auto Encoders to GAN- Usage of Auto Encoders

**Module 2:**

**Convolutional Neural Networks:**

Introduction to CNN- Convolutional Filters- Parameter sharing- ConvNets Visualized.

**Deep GAN:**

Introduction to Deep GAN- Batch Normalization- Understanding Normalization– Computing Normalization.

**Module 3:**

**Evaluation:**

Evaluation Framework- Inception Score- Frechet Inception Distance

**Challenges in Training:**

Adding Network depth- Min-Max GAN- Non-Saturating GANs- When to Stop training?- Wasserstein GAN

**Module 4:**

**Semi Supervised GAN:**

What is Semi Supervised GAN?- Architecture- Training Process- Training Objectives- Implementation- Comparison to fully supervised Classifier

**Conditional GAN:**

Motivation- CGAN Generator- CGAN Discriminator- Architecture- Implementation

**Module 5:**

**Cycle GAN:**

Image to Image Translation- Cycle Consistency Loss- Adversarial Loss- Identity Loss- Architecture- Applications of Cycle GAN

**Applications of GAN:**

Image Generation- Training GANs for specific image generation tasks- Style Transfer- photo-to-painting and day-to-night style transfer- Data Augmentation- generating realistic synthetic data to enhance the performance and generalization of machine learning models.

**Text Books:**

1. GANs in Action,  Deep learning with Generative Adversarial Networks, Jakub Langr, Vladimir Bok, Manning Publication
2. Generative Deep Learning by David Foster, O'Reilly Media, Inc.

**Reference Book:**

1. Learning Generative Adversarial Networks,Kuntal Ganguly, Packt Publishing

2. Generative Adversarial Networks Cookbook, Josh Kalin,Packt Publishing

**Course outcomes:**

**The student will be able to:**

1. Design generative and discriminative models.
2. Implement problems that GANs can solve.
3. Compare and contrast the roles of the generator and discriminator in a GAN system.
4. Inspect the challenges posed by common GAN loss functions.
5. Implement possible solutions to common problems with GAN training.

**Module 1:**

Principles of Parallel and Distributed Computing, Introduction to cloud computing, Cloud computing Architecture, cloud concepts and technologies, cloud services and platforms, Cloud models, cloud as a service, cloud solutions, cloud offerings, introduction to Hadoop and Mapreduce.

**Module 2:**

Cloud Platforms in the Industry, Understanding Scientific Applications for Cloud Environments, cloud applications Healthcare and education, Scientific Applications, Business and Consumer Applications.

**Module 3:**

Virtualization, cloud virtualization technology, deep dive: cloud virtualization, migrating in to cloud computing.

Virtual Machines Provisioning and Virtual Machine Migration Services, On the Management of Virtual Machines for cloud Infrastructure, Comet cloud, T-Systems.

**Module 4:**

Enterprise cloud computing Paradigm, Federated cloud computing Architecture, SLA Management in Cloud Computing, Developing the cloud: cloud application Design.

**Module 5:**

Cloud management, Organizational Readiness and change management in the cloud age, Cloud Security, Data security in the cloud, Legal Issues in the Cloud , Achieving Production Readiness for the cloud Services.

**Text Books:**

1. Cloud Computing: Raj Kumar Buyya ,James Broberg, andrzej Goscinski, 2013 Wiley.
2. Cloud computing: Dr Kumar Saurab Wiley India 2011 **Reference Books:**
3. Cloud Computing: Arshdeep Bahga, Vijay Madisetti, 2014, University Press.
4. Mastering Cloud Computing: Raj Kumar buyya, Christian Vecchiola,selvi-2013.

**E - Resources:**

1. https://nptel.ac.in/courses/106/105/106105167/1
2. https://sjceodisha.in/wp-content/uploads/2019/09/CLOUD-COMPUTING-Principles-and-Paradigms.pdf
3. https://www.alljntuworld.in/download/cloud-computing-cc-materials-notes/
4. https://www.slideshare.net/jeetraj17/cloud-computing-it703-unit-1-5

| Course Outcomes (COs) | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO 1 | PSO 2 |
| CO1 | 2 | 2 | - | - | - | - | - | - | - | - | - | - | 2 | 2 |
| CO2 | 2 | 2 | - | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 |
| CO3 | 2 | 2 | 2 | - | 2 | - | - | - | - | - | - | - | - | 2 |
| CO4 | 2 | 2 | 2 | - | 1 | - | - | - | - | - | - | - | - | - |
| CO5 | 2 | - | - | - | - | - | - | - | - | - | - | - | 2 | 2 |
| Average | 2.0 | 2.0 | 2.0 | 2.0 | 1.7 | - | - | - | - | - | - | - | 2.0 | 2.0 |

**CO-PO/PSO Mapping Chart (3/2/1 indicates strength of correlation)**
**3 – Strong; 2 – Medium; 1 - Weak**

| AY: 2022-23 Onwards | **J. B. Institute of Engineering and Technology** (UGC Autonomous) | **B. Tech ECE** **IV Year-II Sem** | | | |
|---|---|---|---|---|---|
| Course Code: **L420E** | **Principles of Sensors and their Application** **(OE-05)** | L | T | P | D |
| Credits: **3** | | **3** | **0** | **0** | **0** |

**Pre-Requisites:**

**Course Objectives:**

1. Understand the fundamental principles of various sensors and their classifications.
2. Gain knowledge of signal conditioning and interfacing techniques for sensor integration.
3. Explore the applications of physical, chemical, and biological sensors in different domains.
4. Learn about smart sensors, IoT, and their integration in sensor networks.
5. Develop skills in sensor data processing, fusion, and application-specific algorithms.

## Module 1: Introduction to Sensors [8L]

### Unit-I: Overview of Sensors [4L]

Introduction to sensors: Definition, types, and classifications; Sensing principles: Mechanical, electrical, thermal, and optical; Sensor characteristics: Range, sensitivity, accuracy, resolution, and response time

### Unit-II: [4L]

Sensor signal conditioning: Amplification, filtering, and linearization; Sensor interfacing: Analog and digital interfaces; Sensor calibration and compensation techniques

## Module 2: Physical Sensors [9L]

### Unit-I: [5L]

Temperature sensors: Thermocouples, RTDs, thermistors, and semiconductor temperature sensors; Pressure sensors: Piezoresistive, capacitive, and optical pressure sensors; Strain sensors: Resistive, capacitive, and piezoelectric strain gauges

### Unit-II: [4L]

Accelerometers: Piezoresistive, piezoelectric, and capacitive accelerometers; Gyroscopes: Vibrating structure, fiber optic, and MEMS-based gyroscopes; Force and torque sensors: Load cells, strain gauge-based force sensors, and optical torque sensors.

## Module 3: Chemical and Biological Sensors [8L]

### Unit-I: [4L]

pH sensors: Glass electrode and ion-sensitive field-effect transistor (ISFET) sensors; Gas sensors: Electrochemical, semiconductor, and optical gas sensors; Biosensors: Enzyme-based, DNA-based, and immune sensors.

### Unit-II: [4L]

Biosensors (continued): Lab-on-a-chip technology and bio-electrochemical sensors; Environmental sensors: $CO_2$ sensors, humidity sensors, and particulate matter sensors; Biomedical sensors: ECG, EEG, and pulse oximetry sensors.

## Module 4: Smart Sensors and Internet of Things (IoT)[10L]

### Unit-I: [5L]

Introduction to smart sensors: Features, architecture, and applications; Sensor networks: Wireless sensor networks, ad-hoc networks, and protocols; IoT and sensor integration: Data acquisition, processing, and communication.

### Unit-II: [5L]

Energy harvesting for sensors: Solar, thermal, and vibration energy harvesting; Wearable sensors: Applications in healthcare, sports, and activity monitoring; Industrial IoT: Sensor applications in manufacturing, automation, and predictive maintenance

## Module 5: Name of the Module [9L]
### Unit-I: [5L]
Signal processing techniques for sensor data: Filtering, noise reduction, and feature extraction; Data fusion: Sensor fusion techniques and algorithms Sensor arrays: Beamforming and spatial processing.
### Unit-II: [4L]
Sensor-based localization and tracking: GPS, RFID, and computer vision-based methods; Sensor applications in robotics and automation Emerging trends in sensor technology and applications.

### Text Books

1. Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill,2009.
2. Sawney A K and PuneetSawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12th edition, DhanpatRai & Co, New Delhi,2013.

### Reference Books

1. Sensors and Signal Conditioning by Ramon Pallas-Areny and John G. Webster
2. Principles of Measurement Systems by John P. Bentley
3. Sensors and Sensing Technology  by V. Venkatesh and R. Srinivasan
4. Biosensors: Essentials by Min Wang

### E-Resources

1. NPTEL: Introduction to Sensors (https://nptel.ac.in/courses/117/101/117101073/)
2. Lecture Notes on Sensors and Transducers (http://people.scs.carleton.ca/~soma/tech-notes/Sensors.pdf)
3. Tutorialspoint: Sensors (https://www.tutorialspoint.com/sensors/index.htm)
4. NPTEL: Physical Sensors (https://nptel.ac.in/courses/117/105/117105057/)
5. Lecture Notes on Physical Sensors (http://www-personal.umich.edu/~johannb/Pubs/Sensors-Chapter-Outline.pdf)
6. Tutorialspoint: Physical Sensors (https://www.tutorialspoint.com/physical_sensors/index.htm)
7. NPTEL: Chemical Sensors (https://nptel.ac.in/courses/117/106/117106071/)
8. Lecture Notes on Chemical Sensors (http://www-personal.umich.edu/~johannb/Pubs/Sensors-Chapter-Outline.pdf)
9. Tutorialspoint: Chemical Sensors (https://www.tutorialspoint.com/chemical_sensors/index.htm)
10. NPTEL: Smart Sensors (https://nptel.ac.in/courses/117/107/117107044/)
11. Lecture Notes on IoT and Smart Sensors (https://www.iotforall.com/iot-resources/lecture-notes-internet-of-things/)
12. Tutorialspoint: IoT (https://www.tutorialspoint.com/internet_of_things/index.htm)
13. NPTEL: Sensor Data Processing (https://nptel.ac.in/courses/117/103/117103042/)
14. Lecture Notes on Sensor Data Processing (http://www.dca.fee.unicamp.br/~miyagi/lectures/dsp-lecture-notes.pdf)

15. Tutorialspoint: Signal Processing
    (https://www.tutorialspoint.com/digital_signal_processing/index.htm)

## Course Outcomes

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

**CO1**. Identify and select appropriate sensors for specific applications based on their sensing principles and characteristics.
**CO2**. Design sensor interfaces and signal conditioning circuits to enhance the accuracy and reliability of sensor measurements.
**CO3**. Analyze and evaluate the performance of physical, chemical, and biological sensors in real-world scenarios.
**CO4**. Develop solutions using smart sensors, IoT, and sensor networks for monitoring and control applications.
**CO5**. Apply signal processing techniques to sensor data for feature extraction, localization, and tracking in diverse applications.

## 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** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO3** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO5** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Average** | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

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

**Pre-Requisites:** Nil

**Course Objectives:**

Students will learn to

1. Get an understanding of various measurement systems functioning and metrices for performance analysis.

2. Understand the principle of operation, working of different electronic instruments viz. Signal generators, signal analyzers, recorders and measuring equipments.

3. Use various measurement techniques for measurement of different physical parameters using different classes of transducers.

4. Gain knowledge on parameters and functions of CRO.

5. Obtain knowledge on various transducers.

**Module 1:**

**Unit-I:**

Block Schematics of Measuring Systems, Performance characteristics, Static characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters.

**Unit-II:**

Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments. Electronic Voltmeters, Multimeters, AC,DC Meters, Digital Voltmeters: Ramp Type, Staircase Ramp, Dual Slope Integrating type, Successive Approximation Type,Autoranging,31/2,33/4 Digit Display, Pico ammeter, High Resistance Measurements, Low current Ammeter, Applications.

**Module 2:**

**Unit-I:**

Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary waveform Generator, Video Signal Generators, and Specifications.

**Unit-II:**

Signal Analyzers, AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillaors.

**Module 3:**

**Unit-I:**

DC and AC Bridges: Wheat Stone Bridge, Kelvin Bridge, AC Bridges, Maxwell, Hay, Schering, Wien, Anderson Bridges.

**Unit-II:**

Resonance Bridge, Similar Angle Bridge ,Wagner's ground connection, Twin T, Bridged T Networks, Detectors.

**Module 4:**

**Unit-I:**

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications, Specifications.

**Unit-II:**

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs, Frequency Measurement, Period Measurement, Errors in time/Frequency Measurements, universal counters, Extension of range; Recorders: Strip chart, X-Y, oscillographic recorders.

**Module 5:**

**Unit-I:**

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

**Unit-II:**

Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure - High Pressure, Vacuum level, Temperature - Measurements, Data Acquisition Systems.

**Text Books**

1. Electronic Measurements and Instrumentations by K. Lal Kishore, Pearson Education - 2010.
2. Electronic instrumentation: H.S.Kalsi - TMH, 2nd Edition 2004.

**Reference Books**

1. Electronic Instrumentation and Measurements - David A. Bell, Oxford Uiv. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI, 5th Edition, 2003.
3. Electronic Measurements and Instrumentation: B. M. Oliver, J. M. Cage TMH Reprint.
4. Industrial Instrumentation: T. R. Padmanabham Spiriger 2009.

**Course Outcomes**

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

**CO1**. List the various measurement techniques available and analyze the basic working of instruments used for measurement..

**CO2**. Compute the errors in measurements and their rectification

**CO3**. Analyse the working of AC and DC bridges.

**CO4**. Illustrate the basic principle and working of Oscilloscopes

**CO5**. Distinguish different types of transducers.

**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** | 2 | - | - | - | - | - | - | - | - | - | - | - | 2 | - |
| **CO3** | 2 | 2 | - | 2 | - | - | - | - | - | - | - | 2 | 2 | - |
| **CO4** | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 |
| **CO5** | 2 | - | 2 | - | - | - | - | - | - | - | - | - | 2 | - |
| **Average** | 2.2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 2 |

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

**Pre-Requisites: Electrical Measurements**

## Module 1: Characteristics of Measuring Instruments and Signal Representations

### Unit 1 [6L]

Measuring Systems, Performance Characteristics, – Static characteristics, Dynamic Characteristics; Errors in Measurement – Gross Errors, Systematic Errors, Statistical Analysis of Random Errors.

### Unit 2 [6L]

Signal and their representation: Standard Test, periodic, aperiodic, modulated signal, sampled data, pulse modulation and pulse code modulation.

## Module 2: Oscilloscope and Digital Voltmeters

### Unit 1 [6L]

Cathode ray oscilloscope-Cathode ray tube-time base generator-horizantal and vertical amplifiers-CRO probes-applications of CRO-Measurement of phase and frequency-lissajous patterns-Sampling oscilloscope-analog and digital type.

### Unit 2 [6L]

Digital voltmeters- Successive approximation, ramp, dual-Slope integration continuos balance type-Microprocessor based ramp type DVM digital frequency meter-digital phase angle meter.

## Module 3: Wave Analyzers and Spectrum Analyzers

### Unit 1 [5L]

Wave Analyses - Frequency selective analyzers, Heterodyne, Application of Wave analyzers-Harmonic Analyzers, Total Harmonic distortion.

### Unit 2 [5L]

Spectrum analyzers, Basic spectrum analyzers, spectral displays, vector impedance meter, Q meter. Peak reading and RMS voltmeters.

## Module 4: Transducers

### Unit 1 [6L]

Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of resistor, inductor, LVDT and capacitor transducers; LVDT Applications.

### Unit 2 [6L]

Strain gauge and its principle of operation, gauge factor, Thermostats, Thermocouples, Synchros, Piezo electric transducers, photovoltaic, photo conductive cells, photo diodes.

## Module 5: Measurement of Non-Electrical Quantities

### Unit 1 [5L]

Measurement of strain, Gauge Sensitivity, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque.

### Unit 2 [5L]

Measurement of Temperature, Pressure, Vacuum, Flow, Liquid level.

**Text Books**

1. A. K. Sawhney, "A course in Electrical and Electronics Measurements and Instrumentation", Dhanapath Rai and Sons., 10<sup>th</sup> Edition, 2007.
2. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India.

### Reference Books

1. J.B. Gupta," A course in Electronics and Electrical Measurements and Instrumentation", S. K. Kataria & Sons, 2009.
2. H.S. Kalsi," Electronic Instrumentation", Tata McGraw Hill, 2004.
3. U. A. Bakshi, A. V. Bakshi "Electrical Measurements and Instrumentation", Technical Publications, 2009

### E-Resources

1. https://nptel.ac.in/courses/108/105/108105153/
2. https://nptel.ac.in/courses/112/106/112106138/
3. https://nptel.ac.in/courses/112/107/112107242/

### Course Outcomes

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

**CO1.** Compare the performance characteristics of Measuring Instruments.

**CO2.** Understand operating principles of CRO and Digital Voltmeters.

**C03.** Understand operating principles of Wave Anlayzer and Spectrum Analyzer.

**C04.** Summarize the operation of various Transducers.

**C05.** Measure Non-Electrical Quantities using Transducers.

### 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 | - | - | - | - | - | 2 | - |
| **CO2** | 3 | - | 1 | 3 | - | - | 2 | - | - | - | - | - | 3 | - |
| **CO3** | 3 | - | 3 | 2 | - | - | 2 | - | - | - | - | - | 3 | - |
| **CO4** | 2 | - | 3 | 2 | - | - | 1 | - | - | - | - | - | 3 | - |
| **CO5** | 1 | - | 2 | 3 | - | - | 2 | - | - | - | - | - | 2 | - |
| **Average** | 2.2 | - | 2.2 | 2.4 | - | - | 2 | - | - | - | - | - | 2.6 | - |

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

| AY: 2022-23 Onwards | J. B. Institute of Engineering and Technology (UGC Autonomous) | | B. Tech IT IV Year-II Sem | | |
|---|---|---|---|---|---|
| Course Code: **L42OH** | **Cyber Laws and Ethics** (Open Elective-V) | | L | T | P | D |
| Credits: **3** | | | **3** | **0** | **0** | **0** |

**Unit I: Information Technology & Cyber Crimes:**

Introduction, Glimpses, Definition and Scope, Nature and Extent, Know no Boundaries, Rapid Transmission and Accuracy, Diversity and Span of Victimization, Cyber World, Inadequacy of Law, Influence of Teenagers

**Unit II: Technology & Forms of Cyber Crimes:**

Influence of Technology on Criminality, Forms of Cyber Crimes.

**Unit III: Cyber Crimes 'and Global Response:**

Global Perspective, Country wise Legal Response, Country wise Analysis.

**Unit IV: Investigation in Cyber Crimes: Implications and Challenges:**

Introduction, Procedural Aspects, Issues, Complications and Challenges Concerning Cyber Crimes, Problems and Precautionary measures for Investigation.

**Unit V: Cyber Crimes: Discovery and Appreciation of Evidences:**

Introduction, Law of Evidence, Evidences in Cyber Crimes: Challenges and Implications, Computer Generated Evidence and their Admissibility, Judicial Interpretation of Computer related Evidence.

**Text Book:**

1. Dr Pramod Kr.Singh, "Laws on Cyber Crimes [Along with IT Act and Relevant Rules]" Book Enclave Jaipur India..

**Course Outcomes**: on completion of this course, the students should be able to:

**CO 1**. Understand Cyber Space, Cyber Crime, Information Technology, Internet & Services.

**CO 2**. List and discuss various forms of Cyber Crimes

**CO 3**. Explain Computer and Cyber Crimes

**CO 4**. Understand Cyber Crime at Global and Indian Perspective.

**CO 5**. Describe the ways of precaution and prevention of Cyber Crime as well as Human Rights.

**Pre Requisites:**     Nil

## Course Objectives

This course will enable students to:

1. To introduce about concepts of stress and strain and failure criteria for rock and rock mass.

2. To acquaint with pre-mining stresses in rock and various methods of rock stress determination, its importance in mining applications.

3. To get idea about various engineering properties of rocks and soil; rock mass classification and soil classification methods

4. To get idea about instrumentation and monitoring systems used in surface and underground mine excavation stability.

5. To know about various ground improvement techniques and methods for safe mining operations

## Module 1

Basic concept of stress, strain and failure of rock, Analysis of stress, Analysis of strain, Constitutive relations, Parameters influencing strength/stress-strain behavior, Failure Criteria for Rock and Rock Mass Classical theories of rock failure: Coulomb's criterion, Mohr's criterion, Pre-mining state of Stress Stresses in rock mass, Factors influencing the in-situ state of stress, Estimating in situ stresses

## Module 2

Rock mass Classification and soil characterization, Overview of shear strength and compressibility of soil, Physico-mechanical properties of intact rock, Rock mass classification methods and their applications, Soil classification methods and their applications

## Module 3

Response of rock mass and soil to excavation, Response of rock mass to Excavations Underground, Induced stresses and displacements around single opening in rock mass, Ground support interaction analysis and reinforcement of ground (rock mass and soil), selection and design of support systems.

## Module 4

Slope Engineering: Slope failure and causes; Basic approaches to slope stability analysis and stabilisation, Monitoring of Excavation Stability: Purpose and nature of monitoring,

Instrumentation and monitoring systems - Load; Stress and Deformation measuring, devices; Interpretation of monitoring data; Practical aspects of monitoring

## Module 5

Ground improvement; grouting, fore polling, pre-reinforcement, shotcreteing and other methods

## Textbooks

1. Introduction to Rock Mechanics, Goodman, RE.
2. Fundamental of Rock Mechanics by Jaeger, J.C. and Cook, NGW

## Reference Books

1. Underground Excavation in Rock, Hoek, E and Brown, ET
2. Rock Mechanics for Underground Mining, Brady, BHG and Brown, ET

## Course Outcomes

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

1. Learn about concepts of stress and strain and failure criteria for rock and rock mass.

2. Learn about pre-mining stresses in rock and various methods of rock stress determination, its importance in mining applications.

3. Understand various engineering properties of rocks and soil; rock mass classification and soil classification methods.

4. Learn about instrumentation and monitoring systems used in surface and underground mine excavation stability.

5. Learn about various ground improvement techniques and methods for safe mining operations

**Course Objective:** To understand the importance of Customer Relationship Management in Business.

**UNIT-I:**

**Introduction to CRM:** Concepts, Evolution, Need, understanding goals and objectives of CRM, Components of CRM, Benefits, CRM as a strategic marketing tool, CRM significance to the stakeholders, CRM Applications in Consumer and Business Markets, CRM Issues & Problems.

**UNIT-II:**

**Building Customer Relations:** Customer information Database – Customer Profile Analysis - Customer perception, Expectations analysis – Customer behaviour in relationship perspectives; individual and group customer's -Customer life time value – Selection of Profitable customer segments - Customer Life Cycle, Business Networks and CRM.

**UNIT-III:**

**CRM Process:** Introduction and Objectives of a CRM Process; an Insight into CRM and e-CRTA/online CRM, The CRM cycle i.e. Assessment Phase; Planning Phase; The Executive Phase; Modules in CRM, 4C's (Elements) of CRM Process, CRM Process for Marketing Organization, CRM Value Chain, CRM Affiliation in Retailing Sector.

**UNIT-IV:**

**CRM Structures:** Elements of CRM – CRM Process – Strategies for Customer acquisition –Customer Retention and Development – Strategies for Customer Retention, Models of CRM – G- SPOT Model, KOEL's Model, WebQual Audit Model, ONYX Model - CRM road map for business applications.

**UNIT-V:**

**CRM Planning and Implementation:** Strategic CRM planning process – Implementation issues – CRM Tools- Analytical CRM –Operational CRM – Call centre management – Role of CRM Managers,Trends in CRM- e-CRM Solutions –Features and advantages of e CRM, Functional Components of eCRM- Data Warehousing – Data mining for CRM – an introduction to CRM software packages.

**Course Outcome:** Students will be able to understand
1. need of CRM
2. building customer relations

3. CRM process
4. CRM structures
5. Planning and Implementation of CRM.

**Suggested Readings:**

1. G. Shainesh, Jagdish, N.Sheth, Atul Parvatiyar, Customer Relationship Management: Emerging Concepts, Tools and Applications, Macmillan 2005.
2. Francis Buttle, Customer Relation Management: Concepts and Technologies, 2e, Routledge, 2013.
3. Ekta Rastogi, Customer Relation Management: Text and Cases, Excel Books, 2011.
4. Zikmund, Customer Relationship Management, Wiley 2012.
5. Paul Greenberg, CRM at the speed of light, 4e, TMH, 2009.
6. Lakshman Jha, Customer Relationship Management: A Strategic Approach, Global India Pvt Ltd, 2008.