B. Tech - Civil Engineering Course Structure (MLRS-R24)

Applicable From 2024-25 Admitted Batch Structure

Breakup

S. No	Category	Breakup of credits (Total 160 credits)
1	Humanities and Social Sciences including Management courses (HSMC)	7
2	Basic Sciences Courses (BS)	20
3	Engineering Sciences courses including Workshop, Drawing basics of electrical/mechanical/computer etc. (ES)	24
4	Professional Core courses (PC)	59
5	Professional Electives (PE)	18
6	Open Electives (OE)	9
7	Project work, Seminar and Internship in industry or elsewhere(PS)	23
8	Mandatory Courses	-
	TOTAL	**160**

I YEAR I SEMESTER (I SEMESTER)

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory								
1	2410001	Matrices and Calculus	BS	3	1	0	4	40	60	100
2	2410008	Applied Physics	BS	3	0	0	3	40	60	100
3	2410501	Problem Solving using C and C ++	ES	3	0	0	3	40	60	100
4	2410010	English for Skill Enhancement	HSMC	3	0	0	3	40	60	100
		Laboratory								
1	2410372	Engineering Workshop	ES	0	1	4	3	40	60	100
2	2410071	Applied Physics Laboratory	BS	0	0	2	1	40	60	100
3	2410571	Problem Solving using C and C ++ Laboratory	ES	0	0	2	1	40	60	100
4	2410073	English Language and Communication Skills Laboratory	HSMC	0	0	2	1	40	60	100
		Skill Development Course								
1	2410596	Web Application Development	SDC	0	0	2	1	40	60	100
		Mandatory Course								
1		Foreign Language*	*MC	0	0	0	0	-	-	-
		Induction Program								
Total Credits				**12**	**2**	**12**	**20**	**360**	**540**	**900**

***MC- Students can choose any one of the foreign language from the following course**

(i) 24X0FL1: French

(ii) 24X0FL2: German

(iii) 24X0FL3: Spanish

(iv) 24X0FL4: Korean

I YEAR II SEMESTER (II SEMESTER)

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory								
1	2420002	Differential Equations and Vector Calculus	BS	3	1	0	4	40	60	100
2	2420009	Engineering Chemistry	BS	3	0	0	3	40	60	100
3	2420321	Applied Mechanics	ES	3	0	0	3	40	60	100
4	2420502	Essentials of Problem Solving using Python	ES	3	0	0	3	40	60	100
		Laboratory								
1	2420371	Computer Aided Engineering Graphics	ES	1	0	4	3	40	60	100
2	2420072	Engineering Chemistry Laboratory	BS	0	0	2	1	40	60	100
3	2420176	Elements of Civil Engineering	PC	0	0	2	1	40	60	100
4	2420572	Essentials of Problem Solving using Python Laboratory	ES	0	0	2	1	40	60	100
		Skill Development Course								
1	2420027	Public Speaking Skills	SDC	0	0	2	1	40	60	100
		Mandatory Course								
1	2420026	Yoga and Inner Engineering	*MC	0	0	0	0	-	-	-
Total Credits				**13**	**1**	**12**	**20**	**360**	**540**	**900**

II YEAR I SEMESTER (III SEMESTER)

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory								
1	2430121	Surveying	PC	2	0	0	2	40	60	100
2	2430122	Strength of Materials-I	PC	3	0	0	3	40	60	100
3	2430123	Fluid Mechanics	PC	2	0	0	2	40	60	100
4	2430006	Probability and Statistics	BS	3	1	0	4	40	60	100
5	2430507	Data Structures	ES	3	0	0	3	40	60	100
6	243ExL1	ExL: Design and Innovation	EL	0	0	2	1	40	60	100
		Laboratory								
1	2430177	Surveying Laboratory	PC	0	0	2	1	40	60	100
2	2430178	Strength of Materials Laboratory	PC	0	0	2	1	40	60	100
3	2430575	Data Structures Laboratory Using Python	ES	0	0	2	1	40	60	100
		Skill Development Course								
1	2430196	Structural Modeling Laboratory	SDC	0	0	2	1	40	60	100
		Project								
1	2430190	Internship – I *	PS	0	0	2	1	100	-	100
		Mandatory Course								
1		Indian Knowledge System	*MC	0	0	0	0	-	-	-
Total Credits				**13**	**1**	**12**	**20**	**500**	**600**	**1100**

***Students have to complete Internship – I in semester break Minimum 2 weeks after I year II Semester**

ExL – Experiential Learning

***MC- Students can choose any one of the following course**

1. **24XIKS1: Indian Science, Engineering and Technology**
2. **24XIKS2: Fundamentals and Applications of Vedic Mathematics**
3. **24XIKS3: Indian Health, Wellness and psychology – Including Ayurvedic**
4. **24XIKS4: Indian Town Planning and Architecture**

II YEAR II SEMESTER (IV SEMESTER)

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory								
1	2440124	Strength of Materials–II	PC	3	0	0	3	40	60	100
2	2440125	Basic Structural Analysis	PC	3	1	0	4	40	60	100
3	2440126	Hydraulics and Hydraulic Machinery	PC	3	0	0	3	40	60	100
4	2440127	Building Materials, Construction and Planning	PC	3	0	0	3	40	60	100
5	2440202	Basic Electrical and Electronics Engineering	ES	2	0	0	2	40	60	100
6	244ExL2	ExL: Prototype/Model development and Entrepreneurship	EL	0	0	2	1	40	60	100
		Laboratory								
1	2440179	Computer Aided Drawing Laboratory	PC	0	0	2	1	40	60	100
2	2440180	Fluid Mechanics and Hydraulic Machinery Laboratory	PC	0	0	2	1	40	60	100
3	2440272	Basic Electrical and Electronics Engineering Laboratory	ES	0	0	2	1	40	60	100
		Skill Development Course								
1	2440197	Geographic Information Systems Laboratory	SDC	0	0	2	1	40	60	100
		Mandatory Course								
1	2440021	Environmental Science	*MC	0	0	0	0	-	-	-
Total Credits				**14**	**1**	**10**	**20**	**400**	**600**	**1000**

ExL – Experiential Learning

III YEAR I SEMESTER (V SEMESTER)

S. No	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory								
1	2450128	Design of Reinforced Concrete Elements and Drawing	PC	3	1	0	4	40	60	100
2	2450129	Concrete Technology	PC	3	0	0	3	40	60	100
3	2450130	Soil Mechanics	PC	3	0	0	3	40	60	100
4	-	Professional Elective–I	PE	3	0	0	3	40	60	100
5	-	Open Elective–I	OE	3	0	0	3	40	60	100
		Laboratory / Internship								
1	2450181	Concrete Technology Laboratory	PC	0	0	2	1	40	60	100
2	2450182	Structural Analysis Laboratory	PC	0	0	2	1	40	60	100
3	2450183	Soil Mechanics Laboratory	PC	0	0	2	1	40	60	100
		Project								
1	2450191	Field Based Project *	PS	0	0	2	1	100	-	100
		Mandatory Course								
1	2450022	Gender Sensitization	*MC	0	0	0	0	-	-	-
Total Credits				**15**	**1**	**10**	**20**	**460**	**540**	**1000**

***Students have to complete Field Based Project in semester break Minimum 2 weeks after II year II Semester**

III YEAR II SEMESTER (VI SEMESTER)

S. No	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory								
1	2460131	Design of Steel Structures and drawing	PC	3	1	0	4	40	60	100
2	2460132	Environmental Engineering	PC	3	0	0	3	40	60	100
3	2460133	Transportation Engineering	PC	3	1	0	4	40	60	100
4	-	Professional Elective –II	PE	3	0	0	3	40	60	100
5	-	Open Elective–II	OE	3	0	0	3	40	60	100
		Laboratory								
1	2460184	Environmental Engineering Laboratory	PC	0	0	2	1	40	60	100
2	2460185	Transportation Engineering Laboratory	PC	0	0	2	1	40	60	100
3	2460186	Computer Aided Design and Detailing Laboratory	PC	0	0	2	1	40	60	100
		Mandatory Course								
1	2470025	Human Values and Professional Ethics	*MC	0	0	0	0	-	-	-
Total Credits				**15**	**2**	**8**	**20**	**360**	**540**	**900**

IV YEAR I SEMESTER (VII SEMESTER)

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory								
1	2470134	Estimation, Costing and Project Management	PC	3	0	0	3	40	60	100
2	2470135	Water Resources Engineering	PC	2	0	0	2	40	60	100
3	2470010	Business Economics and Financial Analysis	HSMC	3	0	0	3	40	60	100
4	-	Professional Elective -III	PE	3	0	0	3	40	60	100
5	-	Professional Elective- IV	PE	3	0	0	3	40	60	100
6	-	Open Elective - III	OE	3	0	0	3	40	60	100
		Laboratory								
1	2470187	Project Management Laboratory	PC	0	0	2	1	40	60	100
2	2470188	Revit Architecture Laboratory	PC	0	0	2	1	40	60	100
		Project								
	2470192	Internship - II	PS	0	0	2	1	100	-	100
1	2470193	Project Stage–I	PS	0	0	6	3	100	-	100
		Mandatory Course								
1	2440023	Constitution of India	*MC	0	0	0	0	-	-	-
Total Credits				**17**	**0**	**12**	**23**	**520**	**480**	**1000**

***Students have to complete Internship – II in semester break Minimum 2 weeks after III year II Semester**

IV YEAR II SEMESTER (VIII SEMESTER)

S. No.	Course Code	Course Title	Course Area	Hours Per Week			Credits	Scheme of Examination Maximum Marks		
				L	T	P		Internal (CIA)	External (SEE)	Total
		Theory								
2	-	Professional Elective-V	PE	3	0	0	3	40	60	100
3	-	Professional Elective-VI	PE	3	0	0	3	40	60	100
		Project								
1	2480194	Technical Seminar	PS	0	0	4	2	100	-	100
2	2480195	Project Stage-II	PS	0	0	18	9	40	60	100
Total Credits				**6**	**0**	**22**	**17**	**220**	**180**	**400**

Professional Elective (PE) Courses

PE I - Professional Elective I

S. No	Course Code	Course Title
1	2450141	Pre-Engineered Buildings
2	2450142	Elements of Earthquake Engineering
3	2450143	Pre-Fabricated structures
4	2450144	Introduction to Offshore Structures

PE II - Professional Elective II

S. No	Course Code	Course Title
1	2460145	Indeterminate Structural Analysis
2	2460146	Prestressed concrete
3	2460147	Advanced Structural Design
4	2460148	Introduction to Finite Element Methods

PE III - Professional Elective III

S. No	Course Code	Course Title
1	2470149	Groundwater Hydrology
2	2470150	Design of Hydraulic Structures
3	2470151	Water Shed Management
4	2470152	Water Supply Network

PE IV- Professional Elective IV

S. No	Course Code	Course Title
1	2470153	Railway, Airport and Harbour Engineering
2	2470154	Bridge Engineering
3	2470155	Traffic Engineering
4	2470156	Pavement Analysis and Design

PE V- Professional Elective V

S. No	Course Code	Course Title
1	2480157	Industrial Waste Water Treatment
2	2480158	Waste Management
3	2480159	Environmental Impact Assessment
4	2480160	Safety in Construction Practices

PE VI - Professional Elective VI

S. No	Course Code	Course Title
1	2480161	Foundation Engineering
2	2480162	Ground Improvement Techniques
3	2480163	Repair and Rehabilitation of Structures
4	2480164	Remote Sensing and GIS

OE – I (Open Electives Offered to Other Departments)

S. No	Course Code	Course Title
1	24X0101	Introduction to Civil Engineering
2	24X0102	Energy from Waste

OE – II (Open Electives Offered to Other Departments)

S. No	Course Code	Course Title
1	24X0103	Air and Noise Pollution Control
2	24X0104	Green Building Technology

OE – III (Open Electives Offered to Other Departments)

S. No	Course Code	Course Title
1	24X0105	Disaster Management
2	24X0106	Sustainable Engineering

I-I

2410001: MATRICES AND CALCULUS

(CSE, CSD, CSM, ECE, EEE, MECH, CIVIL)

B.Tech. I Year I Sem **L T P C**

3 1 0 4

Course Overview:

Matrix algebra and calculus are essential for understanding and solving complex problems in many scientific and engineering fields. This course provides the mathematical foundation for advanced topics and applications. This course covers matrix theory, linear algebra and calculus. Linear algebra is a branch of mathematics that studies system of linear equations and the properties of matrices. The calculus part of the course typically covers differential and its applications, and integration techniques. Matrix algebra allows us to think of a matrix holistically, generalize and compute derivatives important matrix factorizations, understand how differentiation formulas must be reimagined in large scale computing. Calculus is used to model and solve real- world problems.

Pre-requisites: Mathematics courses of 10+2 year of study.

Course Objectives: The student will try to learn

- Types of matrices and their properties, concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigen values, eigenvectors and reduction of quadratic form to canonical form by orthogonal transformation.
- Geometrical approach to the mean value theorems and their application to the mathematical problems. Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative and finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications.

Course outcomes: After successful completion of the course, students should be able to

CO1: Write the matrix representation of a set of linear equations and to analyses the solution of the system of equations.

CO2: Find the Eigen values and Eigenvectors and reduce the quadratic form to canonical form using orthogonal transformations.

CO3: Solve the applications on mean value theorems and evaluate improper integrals using Beta and Gamma functions.

CO4: Find the extreme values of functions of two variables with/ withoutconstraints.

CO5: Evaluate the multiple integrals and apply the concept to find areas, volumes.

UNIT-I:Matrices **10 L**

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations, L-Udecomposition method.

UNIT-II: Eigen values and Eigenvectors **10 L**

Eigen values, Eigen vectors and their properties (without proof), Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrixbyCayley-HamiltonTheorem,QuadraticformsandNatureoftheQuadraticForms,Reductionof Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III:Calculus 8 L

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 (without proofs).

Beta and Gamma functions and their applications(properties without proof).

UNIT-IV: Multivariable Calculus (Partial Differentiation and applications) 10 L

Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence-independence.Applications:Maximaandminimaoffunctionsoftwovariablesandthreevariables using method of Lagrangemultipliers.

UNIT-V: MultivariableCalculus (Integration) 10 L

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

Applications: Areas (by double integrals) and volumes (by triple integral).

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition,2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5thEditon,2016.

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9thEdition, John Wiley & Sons,2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002.
3. H. K. Dassand Er. RajnishVerma, Higher Engineering Mathematics, S Chand and Company Limited, NewDelhi.

2420008: APPLIED PHYSICS

B.Tech. I Year II. Sem. **L T P C**

3 1 0 4

Course Overview

Applied Physics is the application of the Physics to solve Scientific or Engineering Problems. It is considered as bridge between Physics and Engineering.

Applied Physics under graduate program stress the basic Physics that underlies most developments in engineering and mathematical tools that are important to engineers.

Prerequisites: 10 + 2 Physics

Course Objectives: The student will try to learn :

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

Course Outcomes: After successful completion of the Course the students should be able to

1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic materials and their applications.
4. Appreciate the features and applications of Nano materials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

UNIT - I: QUANTUM PHYSICS AND SOLIDS

Quantum Mechanics: Introduction to quantum physics, Blackbody radiation, Photoelectric effect, de-Broglie Hypothesis and matter waves, Davisson and Germer experiment, Heisenberg uncertainty principle, Born interpretation of the wave function, Time independent Schrodinger wave equation, Particle in one dimensional potential box.

Solids: Free electron theory (Drude& Lorentz, Sommerfeld), Bloch's theorem -Kronig-Penney model, Effective mass of electron, Origin of energy bands, Classification of solids.

UNIT - II: SEMICONDUCTORS AND DEVICES

Intrinsic and extrinsic semiconductors, Hall effect, Direct and Indirect band gap semiconductors, Construction, principle of operation and characteristics of P-N Junction diode, Zener diode and Bipolar junction transistor (BJT)

Opto-devices- Light emitting diode (LED), PIN diode, and Solar cell, their structure, materials, working principle and characteristics, Solar cell application- Space craft.

UNIT - III: DIELECTRIC AND MAGNETIC MATERIALS

Dielectric Materials: Introduction to dielectrics, Polarization, Permittivity, Dielectric constant, Types of polarizations (Qualitative), Internal field in Solids, Clausius-Mossotti equation, Ferroelectric, Piezoelectric and Pyroelectric materials, Applications.

Magnetic Materials: Introduction to Magnetism, Magnetization, Permeability, Susceptibility, Classification of Magnetic Materials, Hysteresis curve, Soft and Hard magnetic materials, Magnetostriction, Magneto resistance, Magnetic field sensors and bubble memory devices.

UNIT - IV: NANOTECHNOLOGY

Nanoscale, Quantum confinement, Surface to volume ratio, Bottom-up fabrication: Sol-gel, Precipitation methods, Top-down fabrication: Ball milling, Physical Vapor Deposition (PVD), Characterization techniques - XRD, SEM and TEM, Applications of nanomaterials.

UNIT - V: LASER AND FIBER OPTICS

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations, Lasing action, Population inversion, Pumping methods, Ruby laser, He-Ne laser, CO_2 laser, Applications of laser- Medical and Military.

Fiber Optics: Introduction to optical fiber, Total internal reflection, Construction of optical fiber, Acceptance angle, Numerical aperture, Classification of optical fibers, Losses in optical fiber, Optical fiber for communication system, Applications of optical fiber-Endoscopy.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G. Kshirsagar& TVS Arun Murthy" A Text book of Engineering Physics", S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, McGraw Hill, 4thEdition,2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1stEdition, 2021.

REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBS Publication, 2ndEdition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons,11thEdition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhya - Nano Materials, New Age International, 1stEdition, 2007.

24X0501:Problem Solving Using C and C++

IB.Tech.I–Sem.

L	T	P	C
3	0	0	3

Course Overview:

The Course Provides good foundation in procedural oriented and object-oriented programming concepts. It provides overview on basic building blocks of procedural oriented concepts like arrays, pointers, structures, strings**.** It comprises object-oriented concepts such as information hiding, encapsulation, inheritance and polymorphism. C programming is used in operating systems, embedded devices, OS kernels, drivers, IoT applications. C++ is widely used for creating graphics-heavy software, game engines, VR applications, and web browsers.

Prerequisites: Nil

Course Objectives: The students will try to learn

- Using of structured programming approach in solving problems
- How to use arrays ,pointers, strings and structures in solving problems
- Defining of structures in C and classes in C++
- Importance of inheritance in object-oriented programming
- Handling of exceptions in programs

Course Outcomes: After successful completion of the course, students should be able to

- Develop programs using Control statements and Repetitive statements
- Modularize the code with functions so that they can be reused
- Learn about Object oriented concepts
- Design programs by using Inheritance concepts
- Implement polymorphism and Exception Handling

Module-I:Introductiontoprogramming [10]

Introduction Procedure Oriented and Object-Oriented Programming. Algorithm, Flowchart, Pseudo code. Creating and Running of C Program. Structure of C program – C character set, C Tokens: Constants, Variables, Keywords, Identifiers, C data types, C operators. Standard I/O in C (scanf, printf), Conditional Control statements (if and Switch) Statements. Repetitive statements: While, Do While and For Loops - Use of Break and Continue Statements.

Module-II: Functions, Arrays, Strings and Pointers [12]

Arrays:Introduction,Declaration,CreatingandAccessingofOne-Dimensional Arrays, Two- Dimensional Arrays.
StringsandPointers:Introductiontostrings,stringhandlingfunctions,Arraysof strings, Introduction to pointers, Dynamic Memory allocation.
Functions: Defining Functions – User Defined Functions, Storage Classes, passing parameters:CallByValue,CallByReference,Recursion,Command-lineArguments.

Module-III: Structures and Classes **[8]**

Structures: Defining structures, initializing structures, unions, Array of structures **OOPS Concepts**: Class, Object, Abstraction, Encapsulation, Inheritance and Polymorphism.
C++ Classes and Data Abstraction: Class definition, Class structure, Class objects, Class scope, this pointer, Friends to a class, Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects, Data abstraction.

Module–IV: Inheritance **[7]**

Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class members, Base and Derived class construction, Destructors, Virtual base class.

Module–V: Polymorphism and ExceptionHandling **[8]**

Virtual Functions and Polymorphism: Static and Dynamic binding, virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors.
Exception handling: Try, throw and catch.

TEXTBOOKS:

1. Forouzan B.A&RichardF.Gilberg,AStructuredProgrammingApproach using C,3rd Edition(2013), Cengage Learning.
2. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Designin C 7th Edition,Pearson
3. ANSIandTurboC++byAshokeN.Kamthane,PearsonEducation
4. RobertLaforeC++

REFERENCES:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. E.Balagurusamy,ComputerfundamentalsandC,2ndEdition,McGraw-Hill
3. YashavantKanetkar,LetUsC,18thEdition,BPB
4. E.Balagurusamy, Object Oriented Programming using C++,2ndEdition, McGraw-Hill

24X0010: ENGLISH FOR SKILL ENHANCEMENT

B.Tech. I Year. I Sem.

L	T	P	C
3	0	0	3

Course Overview:

1. The English language plays a vital role in engineering education. Acquiring LSRW skills has become a prerequisite to learning about different technologies and their intricacies.
2. All these extracts are fascinating, thought-provoking, and contextual to engineering students. The authors have sincerely tried connecting every lesson with the modules of vocabulary, grammar, reading comprehension and writing tasks stipulated under each module. The textbook includes several exercises and activities involving the student's language skills practice. They are extremely encouraging and motivational and cater to a group of students with mixed abilities.
3. Each module starts with the preparatory task which can stimulate an interesting discussion among the students in the classroom. Adequate explanations and more examples are provided in vocabulary and grammar sections to enable students to work independently in and outside the classroom. The reading part suggests improving students' reading skills and provides reading comprehension exercises. The writing module aims at developing the learner's writing skills by providing conceptual discussions and exercises in different forms of written communication such as formal letters, CV/ résumé and job application letters, e-mails, reports, etc.

Prerequisites: Language Comprehension

Course Objectives: The students will try to learn:

1. Improve the language proficiency of students in English with an emphasis onVocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and criticallyusing the theoretical and practical components of the syllabus.

Course Outcomes: After successful completion of the course, students should be able to:

1. Understand the importance of vocabulary and sentence structures.

2. Choose appropriate vocabulary and sentence structures for their oral andwritten communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis andreports in various contexts.

MODULE – I (No of Hours = 7)

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

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

Grammar: Identifying Common Errors in Writing concerning Articles and Prepositions.

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

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

MODULE – II (No of Hours = 6)

Chapter entitled **'Appro JRD' by Sudha Murthy** from ***"English: Language, Context andCulture" published*** by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing concerning Noun-pronounAgreement and Subject-verb Agreement.

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

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

MODULE – III (No of Hours = 7)

The chapter entitled **'Lessons from Online Learning' by F.Haider Alvi, Deborah Hurst et al** from

"English: Language, Context and Culture" published by Orient BlackSwan,

Hyderabad.**Vocabulary**: Words Often Confused - Words from Foreign Languages and their Use in English. **Grammar:** Identifying Common Errors in Writing Concerning Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice **Writing:** Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

MODULE – IV (No of Hours = 6)

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

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

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

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

MODULE – V (No of Hours = 6)

Chapter entitled **'Go, Kiss the World' by Subroto Bagchi** from ***"English: Language,Context and Culture"*** published by Orient BlackSwan, Hyderabad.

Vocabulary: Technical Vocabulary and their Usage

Grammar: Common Errors in English (*Covering all the other aspects of grammar whichwere not covered in the previous modules*)

Reading: Reading Comprehension-Exercises for Practice

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

<u>Note</u>: ***Listening and Speaking Skills which are given under Module 6 in the AICTE ModelCurriculum are covered in the syllabus of the ELCS Lab Course.***

- **<u>Note</u>: 1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is* ***Open-ended***, besides following the prescribed textbook, it is required to prepare teaching/learning materials **the teachers collectively** in the form of handouts based on the needs of the students in their

respective colleges for effective teaching/learning in the class.

- **<u>Note</u>**: **2**. Based on the recommendations of NEP2020, teachers are requested to be flexible in adopting Blended Learning in dealing with the course contents. They are advised to teach 40 per cent of each topic from the syllabus in blended mode.

TEXTBOOK:

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

REFERENCE BOOKS:

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of FunctionalLanguage, Grammar, and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication forEngineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

24X0372: ENGINEERING WORK SHOP
(Common to all branches)

B.Tech.I Year.I Semester

L	T	P	C
0	1	4	3

Course Overview: After successful completion of the course, students should able to learn.

Engineering Workshops: A foundational course aimed at introducing first-year students to a variety of tools, equipment, and techniques essential for creating physical objects and mechanisms using different materials. This course provides an opportunity for students to build confidence and gain practical experience in carpentry, fitting, house wiring, tin-smithy, black smithy, welding, and principles of modern manufacturing processes.

Prerequisite: NIL

Course Objective: The student will able to

1. To gain good basic working knowledge required for the production of various engineering products.
2. To study different tools uses and their demonstration.
3. To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in engineering field.
4. To develop a right attitude, team working, precision and safety at work place.
5. It explains the construction, function use and application different working tools and equipments.

Course outcomes: At the end of the course students should able to

1. Explain the design and model different prototype in the trade of carpentry such as Cross lap joint, Dove tail joint.
2. Demonstrate the design and model various basic prototypes in the trade of fitting such as straight fit and V-fit.
3. Understand to make various basic prototypes in the trade of tin smithy such as rectangular tray and open cylinder.
4. Demonstrate the design and model various basic prototype in welding and black smithy.
5. Understand to perform various basic house wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch.

Course content:

Module -I: CARPENTRY AND FITTING

- Carpentry – Introduction, Carpentry tools, sequence of operations and applications (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
- Fitting – Introduction, fitting tools, sequence of operations and applications (V-Fit, Dovetail Fit & Semi-circular fit)

Module -II: TIN SMITHY AND BLACKSMITHY

- Tin-Smithy – Introduction, Tin smithy tools, sequence of operations and applications (Square Tin, Rectangular Tray & Conical Funnel).
- Blacksmithy- Introduction, Blacksmithy tools, sequence of operations and applications (Round to Square, Fan Hook and S-Hook)

Module -III: HOUSE WIRING AND WELDING

- House-wiring – Introduction, Electrical wiring tools, sequence of Operations and applications (Parallel & Series, Two-way Switch and Tube Light)
- Welding Practice – Introduction, electrode, welding tools, and sequence of Operations. Advantages and applications (Arc Welding).

Text Book:

1. Workshop practice/B.L. Juneja/ Cengage
2. Workshop manual/K.Venugopal/ Anuradha

Reference:

1. Work shop manual /P.Kannaiah/K.L. Narayana
2. Work shop Manual /Venkat Reddy /BSP

24X00071: APPLIED PHYSICS LAB

B.Tech. I Year I Sem.

L	T	P	C
0	0	3	1.5

Course Objectives: The objectives of this course for the student to

1. Capable of handling instruments related to the Hall effect and photoelectric effect Experiment understands their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap.
3. Apply the analytical techniques & graphical analysis for Stewart Gees , LCR & RC .
4. Understanding the method of least squares fitting.
5. To develop intellectual communication skills through discussion on basic principles of scientific concepts in a group.

Course Outcomes: The students will be able to:

1. Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Gain the knowledge in calculating the quality factor and time constant of LCR and RC circuits.
4. Understand the variation of magnetic field at various points.
5. Carried out data analysis.

LIST OF EXPERIMENTS:

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode.
5. Input and output characteristics of BJT (CE, CB & CC configurations).
6. V-I and L-I characteristics of light emitting diode (LED) and LASER.
7. V-I Characteristics of solar cell.
8. Determination of Energy gap of a semiconductor.
9. To determine the time constant of R-C circuit.
10. Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
11. Understanding the method of least squares – Torsional pendulum as an example.
12. Determination of magnetic field induction along the axis of a current carrying coil.

REFERENCE BOOK:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers,2017.

24X0571:Problem Solving Using C and C++ Laboratory

B.Tech. I Year. I Sem

L	T	P	C
0	0	2	1

Course Overview:
The Course Provides good foundation in procedural oriented and object-oriented programming concepts. It provides overview on basic building blocks of procedural oriented concepts like arrays, pointers, structures, strings**.** It comprises object-oriented concepts such as information hiding, encapsulation, inheritance and polymorphism. C programming is used in operating systems, embedded devices, OS kernels, drivers, IoT applications. C++ is widely used for creating graphics-heavy software, game engines, VR applications, and web browsers.

Prerequisites: Nil

Course Objectives: The students will try to learn

- Using of structured programming approach in solving problems
- How to use arrays, pointers, strings and structures in solving problems
- Defining of structures in C and classes in C++
- Importance of inheritance in object-oriented programming
- Handling of exceptions in programs

Course Outcomes: After successful completion of the course, students should be able to

- Develop programs using Control statements and Repetitive statements
- Modularize the code with functions so that they can be reused
- Learn about Object oriented concepts
- Design programs by using Inheritance concepts
- Implement polymorphism and Exception Handling

Week1: Algorithm and Flowchart

1. You are designing a flowchart and algorithm for a distance and speed calculator. The flowchart should prompt the user to input the distance traveled and the time taken and calculate the speed using the formula: **Speed = Distance / Time**.

2. You are developing an algorithm and flow chart for a circle area calculator. The flowchart should prompt the user to input the radius of a circle and calculate the area using the formula: **Area =** πr^2

3. You are designing an algorithm and flowchart for a fuel efficiency calculator in a car rental app. The flowchart should prompt the user to input the distance traveled and the amount of fuel consumed and calculate the fuel efficiency in miles per gallon (MPG) using the formula MPG = Distance / Fuel Consumption.

4. You are developing an algorithm and flowchart for a discount calculator in an online shopping app. The flowchart should prompt the user to input the original price and the discount percentage and calculate the discounted price using the formula: **Discounted Price = Original Price - (Original Price * Discount Percentage /100).**

5. You are developing a flowchart and algorithm for a monthly budget tracker. The flowchart should prompt the user to input their income and expenses and calculate the total savings using the formula **Total Savings = Income - Total Expenses**.

6. You are designing a flowchart for a loan amortization calculator. The flowchart should prompt the user to input the loan amount, interest rate, and duration, and calculate the monthly payment using the formula Monthly Payment = (Loan Amount * Interest Rate * $(1+ \text{Interest Rate})^{\text{Duration}}$) / $((1 + \text{Interest Rate})^{\text{Duration-1}})$.

7. You are developing a flowchart and algorithm for a construction materials calculator. The Flow chart should guide the user through the process of inputting the dimensions ofa room, including the length, width, and height. The goal is to calculate the surface area of the room using the provided formula:
   Surface Area=2*(Length*Width+Length *Height+Width* Height).

8. Developaflowchartandanalgorithmtoconvertagiventimeinhoursandminutesto minutes only. Prompt the user to input the time in hours and minutes and display the converted time in minutes.

Skill Oriented Exercise

9. Farmer Thimmayya bought some mules at Rs. 50 each, sheep at Rs. 40 each, goats at Rs. 25each,andpigsatRs.10each.Theaveragepriceoftheanimalsperheadworkedto Rs. 30.What is the minimum number of animals of each kind did he buy?

10. **AMatterofRupeesandPaisa:**IhavemoneypouchcontainingRs.700.Therareequal numberof25 paise coins, 50 paise coins and 1 rupee coins. How manyof each are there.

11. Developanalgorithmandflowchartthatpromptstheusertoinputtheinitialvelocity, acceleration, and time. Calculate and display the final velocity using the formula Final Velocity = Initial Velocity + (Acceleration * Time).

12. Develop an algorithm and flowchart that prompts the user to input the lengths of the three sides of a triangle. Calculate and display the area of the triangle using Heron's formula: Area=√(s*(s -Side1)*(s-Side2)*(s -Side3)),where s=(Side1+Side2+ Side3) / 2.

Week2: Algorithm and Flowchart

1. ABC Company wants to calculate the monthly salary for its employees based on various components such as basic pay, DA, HRA, and deductions for taxes and provident fund. The company follows the following rules for salary calculation:
   - The basic pay is a fixed amount each employee receives.
   - DAiscalculatedas20 percentage of the basic pay.
   - HRA is calculated as 10percentageofthebasicpay.
   - The gross salary is the sum of the basic pay, DA, and HRA.
   - The net salary is the gross salary minus deductions for taxes and provident fund.

   Develop an algorithm and flow chart to calculate the gross and net salary of the employee. Include the necessary steps to calculate the net salary.

2. Sarah, a dedicated student, wants to calculate her average grade for a semester. She has received marks in four different subjects and seeks assistance in creating an algorithm to determine her average grade based on these marks. Develop an

algorithm and flowchart to help Sarah calculate her average grade for the semester using the marks obtained in these four subjects. Ensure that the algorithm includes the necessary steps to compute the average grade accurately.

3. John is a programmer who wants to convert a given temperature in Celsius to Fahrenheit. Help John in developing an algorithm and flowchart to perform this conversion. Design an algorithm for John to convert a given temperature in Celsius to Fahrenheit. Provide step-by-step instructions for performing the conversion.
4. **The Tall Men Next Door:** Next door to me live four brothers of different heights. Their average height is 74 inches, and the difference in height among the first three men is two inches. The difference between the third and the fourth man is six inches. Can you tell how tall each brother is?

5. **Driving Through the Country:** I decided to travel through the countryleisurely and on the first day I did only 7 miles. On the last day I did 51 miles, increasing my journey by 4 miles per day. How many days did I travel and how far?

6. There is a beautiful pond in a park, filled with clear water. The park management wants to monitor the water level in the pond regularly to ensure it remains at an optimal level. They have asked you to create an algorithm to help them with this task. Develop an algorithm and flow chart to monitor the water level in the pond and notify the park management if it falls below a certain threshold. (Note: You can assume that the input for the current water level and threshold level is obtained from a monitoring device or sensor).

7. If a participant can make one submission every 45 seconds, and a contest lasts for Y minutes, create an algorithm and flowchart to find the maximum number of submissions that the participant can make during the contest? Assume the participant is allowed to make submissions until the last second of the contest.

Skill Oriented Exercise

8. Michael wants to find the largest number among a set of given numbers. Help Michael write an algorithm to determine the largest number from the given inputs. Create an algorithm and flowchart for Michael to find the largest number among a set of given inputs. Provide step-by-step instructions to identify the largest number.

9. A construction worker needs to paint the exterior walls of a rectangular building. The dimensions of the walls are L meters in length, H meters in height, and W meters in width. If the cost of painting is Rs. 20 per square meter, what will be the total cost of painting the walls? Prepare an algorithm and flowchart to calculate the total cost of painting.

10. An ice cream vendor brings 'i' litre of ice cream to a fair. Each cone requires0.25liters of ice cream. If the vendor sells 80 cones, Develop an algorithm and flowchart to find the number of liters of ice cream left with the vendor.

11. Amanda is planning a party and wants to determine the total number of guests attending. Assist Amanda by writing an algorithm to calculate the total number of guests based on the number of adults and children invited. Create an algorithm and flowchart for Amanda to calculate the total number of guests attending her

party, considering the number of adults and children invited. Include the necessary steps to calculate the total number of guests.

Week: 3 Data Types, Console I/O, Operators Storage Classes

1. You are working as a financial analyst at a bank. As part of your job, you need to calculate the maturity amount for fixed deposits (FD) based on the principal amount, interest rate, and duration. For that help me to write a C program that takes the principal amount, interest rate, and duration(in years)as input from the user. Calculate and display the maturity amount using the simple interest formula: Maturity Amount = Principal + (Principal * Interest Rate * Duration).

2. Jenny, a budding mathematician, was studying the concept of area and perimeter. She was given a rectangular garden with a known length and width. Jenny wondered if she could find the area without knowing the width. Can you help Jenny derive a formula to calculate the area of a rectangle using only the length and perimeter?

3. Develop a C program that computes the hypotenuse of a right-angled triangle given the lengths of its two perpendicular sides. Prompt the user to enter the lengths and display the result. (Pythagorean theorem:Hypotenuse^2 = Side1^2 + Side2^2)

4. Once upon a time, there was a mathematician named Alex. Alex loved solving mathematical problems and puzzles. One day, Alex came across an ancient scroll that contained a secret formula to calculate the sum of the first n natural numbers. The scroll mentioned that by using the formula, one could find the sum of any given number of natural numbers without having to manually add them up. Alex was intrigued and decided to test the formula. Can you help Alex implement a C program that uses the formula to calculate the sum of the first n natural numbers?

Instructions:

Write a C program that takes an input integer n from the user and calculates the sum of the first n natural numbers using the formula: **sum=(n*(n+1))/2**

5. Once upon a time in a small town, there were two friends, Kavi and Jei, who were fascinated by the concept of slopes in mathematics. They loved exploring the hills and valleys around their town and wondered how they could calculate the slope of any given landscape. One sunny day, while hiking up a hill, Kavi and Jei discovered an ancient map that had the secret to finding the slope of a line between two points. The map indicated that by using the coordinates of two points, they could determine the slope of the line connecting them. Excited about their discovery, Kavi and Jei decided to create a C program that could calculate the slope for any two points. They wanted to share their program with others so that everyone could explore the slopes of various land scapes. Can you help Kavi and Jei bring their idea to life by implementing a C program that calculates the slope of a line?

Instructions:

Write a C program that prompts the user to enter the coordinates of two points:(x1,y1)and (x2, y2). The program should then

Calculate ,the slope of the line connecting these points using the formula: slope=(y2-y1) /(x2- x1)

Finally, the program should display the calculated slope to the user.

6. Ravi and Kavi are on an exciting treasure hunt adventure, following a map with hidden treasures located at different coordinates. They want to calculate the distance between two treasures to determine how far apart they are. Can you help them by writing a C program that performs this calculation?

Instructions:

Write a C program that prompts the user to enter the coordinates of two treasures: Treasure A and Treasure B. The coordinates should be in the form (x, y). Calculate the distance between the treasures using the distance formula:
distance = sqrt ((x2 - x1)^2 + (y2 - y1)^2)
Finally ,output a message indicating how far a part the treasures are.

7. Imagine a scenario where there is a coconut tree with multiple coconuts hanging from it. There is a person standing at a distance of "D" meters away from the tree. The coconuts are positioned at a height of "H" meters from the ground. Could you please help write a C program that calculates the angle at which the person should aim in order to hit the coconuts? (Hint: you can use the inverse tangent function (atan() in C) to determine the angle based on the ratio of the height of the coconuts to the distance from the tree.)

Skill Oriented Exercise

8. In a faraway kingdom, two treasure hunters named Alex and Bella embarked on a daring quest to find valuable treasures. While exploring a mysterious cave, they stumbled upon two treasure chests, each containing a unique gemstone. Curiosity took over, and they decided to swap the gemstones inside the chests. However, a magical enchantment prevented them from directly swapping the gemstones. To fulfill their quest and restore the treasures to their rightful chests, Alex and Bella realized they could use a third variable and arithmetic operations. Can you help them by writing a C program that takes the values of the gemstones as input, and swap their values.

9. Emily, a young architect, was working on designing a cylindrical water tank for a new building. As she was finalizing the plans, she needed to calculate the surface area of the cylinder to determine the amount of material required for its construction. However, she was unsure of the exact formula and the steps involved in the calculation. Can you help Emily by writing a C program that assists her in calculating the surface area of a cylinder?(Surface Area = $2\pi r^2 + 2\pi rh$)

10. Hemanthisanarchitectwhowantstodesignagardenwithabeautifulpolygon-shaped fountain at its center. He needs to calculate the area of the polygon so that he can determine the appropriate size for the fountain. Help Hemanth by writing a C program that calculates the area of a regular polygon when given the number of sides and the length of each side.

Area=(num Sides* side Length*side Length)/ (4 *tan(π/ num Sides))

11. Prathima loves ice cream cones and wants to decorate the surface of her favorite ice cream cone with colorful stickers. To know how many stickers she needs, she wants to calculate the surface area of the cone. Help Prathima by writing a C program that calculates the surface area of a cone when given the radius of the base and the slant height, (SurfaceArea=π*r*(r+l))

12. **RIGHT FOOT FORWARD:** A short man takes three steps to a tall man's two steps. They both start out on the left foot. How many steps do they have to take before they are both stepping out on the right foot together?

Week: 4DataTypes, Console I/O, Operators Storage Classes

PREDICTTHEOUTPUT:

1.

```
#include<stdio.h>
int main()
{
inta=5;floatb=3.5;
intresult=a+b;printf("%d\n",result);return0;
}
```

Output:

2.

```
#include<stdio.h>
intmain(){inta=10;intb=20;
intresult=a*b/4%3;printf("%d\n",result);return0;
}
```

Output:

3.

```
#include<stdio.h>
intmain(){inta=15;intb= 10;
intresult=(a>b)&&(b!=0);printf("%d\n", result); return0;
}
```

Output:

4.

```
#include<stdio.h>
intmain(){inta=10;intb= 5;
intresult=(a>b)||(a==10);printf("%d\n",result);
return0;
}
```

Output:

5.

```
#include<stdio.h>
int main(){
int x=3,y=2;
intresult=x*y-y/x%y;printf("%d\n", result);return 0;
}
```

Output:

6.

```
#include<stdio.h>
intmain(){intx=5;
 int *ptr1 = &x;
int**ptr2=&ptr1;printf("%d\n",**ptr2);return0;
}
```

Output:

7.

```
#include<stdio.h>
int main(){intx=5;
int*ptr1,*ptr2;ptr1 =&x;
ptr2=ptr1;printf("%d\n",*ptr2);return0;
}
```

Output:

8.

```
#include<stdio.h>
int main(){intx=51;
int*ptr=&x; printf("%d\n",*ptr);x=15;
 printf("%d\n",*ptr); return 0;
}
```

Output:

9. #include<stdio.h>

Output:

```
intmain(){float*ptr;
printf("Sizeofptr:%lubytes\n",sizeof(ptr));return0;
}
```

10. #include<stdio.h> **Output:**

```
intmain(){doublearr[5];
printf("Sizeofarr:%lubytes\n",sizeof(arr));return0;
}
```

11. #include<stdio.h> **Output:**

```
intmain(){
intx=10;if(x>5){
printf("Hello\n");
}
printf("Goodbye\n");return0;
}
```

Skill Oriented Exercise

Find the syntax error, logical errors if any in the following code snippet:

1. #include<stdio.h> **Errors:**

```
int main(){
printf("Hello,KLUFamily!\n")return0;
}
```

2. #Include<stdio.h> **Errors:**

```
intmain(){
int x = 5, y= 0;
intresult=x/y;printf("Theresultis:%d\n",result);
return0;
}
```

3. #include<stdio.h> **Errors:**

```
intmain(){intx=5;int*ptr;
*ptr=&x;printf("%d\n",*ptr);return0;
}
```

4. #include<stdio.h> **Errors:**

```
intmain(){intx=-5;if(x){
printf("xisnotzero\n");
}else
{
printf("xiszero\n";)
}
return0;
}
```

Week5:If else and Ternary Operator

1. Chef and Chefina are playing with dice. In one turn, both of them roll their dice at

once. They consider a turn to be good if the sum of the numbers on their dice is greater than
6. Given that in a particular turn Chefand Chefinagot Xand Yon their respective dice, find whether the turn was good.

2. Chef has been working hard to compete in MasterChef. He is ranked X out of all contestants. However, only 10 contestants would be selected for the finals. Check whether Chef made it to the top 10 or not?

3. Apple considers any I Phone with a battery health of 80% or above, to be in *optimal* condition. Given that your iPhone has X% battery health, find whether it is in *optimal* condition.

4. In a classic chase, Tom is running after Jerry as Jerry has eaten Tom's favorite food. Jerry isrunningataspeedof$X$metrespersecondwhileTomischasinghimataspeedof Y metres per second. Determine whether Tom will be able to catch Jerry.
Note that initially Jerry is not at the same position as Tom.

5. Chef has started studying for the upcoming test. The textbookhas Npages in total.Chef wants to read at most X pages a day for Y days. Find out whether it is possible for Chef to complete the whole book.

6. Chefhasfinallygotthechanceofhislifetimetodriveinthe$F$1tournament.But,thereis oneproblem.Chefdidnotknowaboutthe107%ruleandnowheisworriedwhetherhe will be allowed to race in the main event or not.
Giventhefastestfinishtimeas$X$secondsandChef'sfinishtimeas$Y$seconds, determine whether Chef will be allowed to race in the main event or not.
Note that, Chef will only be allowed to race if his finish time is within **107%** of the fastest finish time.

Skill Oriented Exercise

7. Chefwantstohostapartywithatotalof$N$people.However,thepartyhallhasa capacity of X people. Find whether Chef can host the party.

8. Chef has to attend an exam that starts in X minutes, but of course, watching shows takes priority.Everyepisodeoftheshowthat Chefiswatching,is24minutes long. Ifhe starts watching a new episode now, will he finish watching it **strictly before** the exam starts?

9. Chef has to travel to another place. For this, hecanavail anyoneoftwocab services.
   - The first cab service charges Xrupees.
   - The second cab service charges Yrupees.

   Chef wants to spend the **minimum** amount of money. Which cab service should Chef take?

10. Chef categorizes an Instagram account as *spam*,if,the *following* count of the account is more than 10 times the count of *followers*.
Giventhe*following*and*follower*countofanaccountas$X$and$Y$respectively,find whether it is a *spam* account.

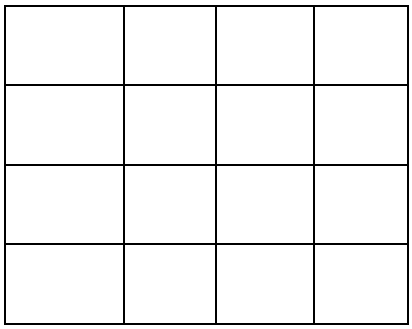
11. ChefiswatchingTV.ThecurrentvolumeoftheTVis$X$.Pressingthevolumeupbuttonofthe

TVremoteincreasesthevolumeby11whilepressingthevolumedownbuttondecreasesthe volumeby11.Chefwantstochangethevolumefrom$X$to$Y$.Findtheminimumnumberof button presses required to do so.

12. Cities on a map are connected by a number of roads. The number of roads between each cityisinanarrayandcity0isthestartinglocation.Thenumberofroadsfromcity0tocity1 isthefirstvalueinthearray,fromcity1tocity2inthesecond,andsoon.Howmanypaths aretherefromcity0tothelastcityinthelist,modulo1234567?

13. Square within Square

WriteaCprogramtodeterminethenumberofsquaresinthegivenillustration below



Week6: Loops, Increment and Decrement operator

1. Sum of digits of five digit number.

Given the five digit number print the sum of its digits.

Input

10564

Output

16

2. Write a program that takes two integers as input, start and end. The program should use for loop to iterate from start to end (both inclusive).

3. WriteaCprogramthattakestheinputformultipletestcases.Foreachtestcase,the program should receive two integers, E and K, representing the energyat the lowest trophiclevelandtheenergyreductionfactor,respectively.Theprogramshouldcalculate and output the maximum length of the food chain for each test case.

4. Write a program in C that takes an integer, n, as input, representing the number of multiplicationtablestobegenerated.Theprogramshouldoutputthemultiplicationtable for each number from 1 to n, up to a multiple of 10.

5. Alice,Bob,andCharliehavedifferentpreferencesfornumbers.Alicelikesnumbersthat are even and multiples of 7, while Bob prefers numbers that are odd and multiples of 9. They have found a number, A, and the task is to determine who takes it home.

Write a program that takes an integer, A, as input and outputs the person who takes the number home based on their preferences. If A is an even multiple of 7, Alice takes it home. If A is an odd multiple of 9, Bob takes it home. If neither Alice nor Bob likes the number, Charlie takes it home.

6. Chef owns a car that can run 15 kilometers using 1 litre of petrol. He wants to attend a programmingcampatDAIICT,whichisadistanceofYkilometersfromhishouse.Chef

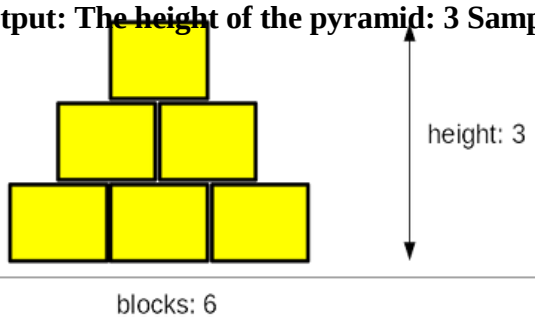
currently has X litres of petrol in his car. The task is to determine whether Chef can attend the event at DAIICT and return to his home with the given amount of petrol.Write a program that takes two integers, X and Y, as input and outputs whether Chef can complete the round trip with the available petrol.

Skill Oriented Exercise

7. Listen to this story: a boy and his father, a computer programmer, are playing with wooden blocks. They are building a pyramid. Their pyramid is a bit weird, as it is actually a pyramid- shaped wall - it's flat. The pyramid is stacked according to one simple principle: each lower layer contains one block more than the layer above. The figure illustrates the rule used by the builders:

Note: the height is measured by the number of fully completed layers –if the builders don't have a sufficient number of blocks and cannot complete the next layer, they finish their work immediately.

Sample input: 6
Expected output: The height of the pyramid: 3 Sample input:1000



Expected output: The height of the pyramid:44

8. **The Special Number**
There is a number whose double is greater than its half by45.Can you find this number?

9. Chef is a student at a university, and the university has a requirement that students must be present foratleast75%oftheworkingdaysinasemestertopass.Thesemesterhasa total of 120 working days. Chef has been taking a lot of holidays and is worried about meeting the attendance requirement. The information about the days Chef has attended or been absent is given as a sequence of N bits: B1, B2,..., BN. If Bi =0, it means Chef was absent on the ith day, and if Bi=1,itmeans Chef was present on that day. The task is to determine if Chef can pass the attendance requirement by the end of the semester. Write a program that takes an integer N as input, followed by a sequence of Nbits, and out puts whether Chef can hope to pass the attendance requirement or not.

10. There are N piles where the ith pile consists of A_i stones. Chef and Chef in a are playing a game taking alternate turns with Chef starting first. In his/her turn, a player can choose any non-empty pile and remove exactly 1 stone from it. The game ends when exactly1 pile becomes empty. The player who made the last move wins. Determine the winner if both players play optimally.

11. Write the c program for following pattern
12. Write a program to obtain a number N and increment itsvalueby1ift he number is divisible

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

by4 otherwise decrement its value by 1.

Week7: Arrays

1. Given a large integer represented as an integer array digits, where each digits[i]is the i-th digit of the integer, ordered from most significant to least significant in left-to-right order (without any leading zeros), implement a program to increment the large integer by one and return the resulting array of digits.

2. Chef has set a target to solve at least 10 problems every week for a duration of 4 weeks. The input consists of four integers representing the number of problems Chef solved in each week (P1, P2, P3, and P4). The task is to determine the number of weeks in which Chefmet his target. The output should be a single integer indicating the count of weeks where Chef solved at least 10 problems.
3. Code Chef recently revamped its practice page to make it easier for users to identify the next problems they should solve by introducing some new features: Recent Contest Problems - contains only problems from the last 2 contests Separate Un-Attempted, Attempted, and All tabs.

Problem Difficulty Rating-there commended drop down menu has various difficulty ranges so that you canattempttheproblemsmostsuitedtoyourexperiencePopularTopicsandTags. Like most users, Chef didn't know that he could add problems to a personal to-do list by clickingonthemagic'+'symbolonthetop-rightofeachproblempage.Butoncehefound out about it ,he went crazy and added loads of problems to his to-do list without looking at their difficulty rating.

Chef is a beginner and should ideally try and solve only problems with difficulty rating strictly lessthan1000.Givenalistofdifficultyratingsforproblemsintheche f'sto-dolist,please helphimidentifyhowmanyofthoseproblemsChefshouldremovefromhisto-dolist,sothat he is only left with problems of difficultyratinglessthan1000.

4. You are given an array price where prices[i] is the price of a given stock on the ith day. You want to maximize your profit by choosing a single day to buy one stock and choosing a different day in the future to sell that stock. Return the maximum profit you can achieve from this transaction. If you cannot achieve any profit, return 0.

5. Given a non-empty array of integer's nums, every element appears twice except for one. Find that single one. You must implement a solution with a linear runtime complexity and use only constant extra space.

6. Given an array nums of size n, return the majority element. The majority element is the element that appears more than ⌊n / 2⌋ times. You may assume that the majority element always exists in the array.

7. Write a C program to calculate the factorial of small positive integers. The input consists of an integer 't' representing the number of test cases, followed by 't' lines containing a single

integer 'n' (1 <= n <= 100) for each test case. The output should display the factorial of 'n' on a separate line for each input value of 'n'.

8. (Puzzle)On the Way to Market One morning.
   I was on my way to the marketandmetamanwhohad4wives.Eachofthewiveshad4 bags ,containing 4 dogsandeachdoghad4puppies.Taking all things into consideration how many were going to the market?

9. Vasyalikesthenumber239.Therefore,he considers a number pretty if its last digit 2,3 or 9.Vasya wants to watch the numbers between Land R(both inclusive),so he asked you to determine how many pretty numbers are in this range. Can you help him?

10. You are participating in a contest which has 11 problems (numbered 1 through 11). The first eight problems (i.e. problems 1,2,…,8) are scorable, while the last three problems (9,10 and 11) are non-scorable — this means that any submissions you make on any of these problems do not affect your total score.
    Your totals core is the sum of your best scores for all scorable problems. That is, for each scorable problem, you look at the score so fall submissions you made on that problem and take the maximum of these scores(or0if you didn't make any submissions on that problem); the total score is the sum of the maximum scores you took. You know the results of all submissions you made. Calculate your total score.

Skill Oriented Exercise

11. WriteaCprogramtohelpJoeandLillymultiplytwomatrices,AandB.Theprogram should take input for multiple test cases. For each test case, the program should read the dimensions and values of matrices A and B. If the multiplication is possible, the program should print the output matrix values. If the multiplication is not possible, the program should print "IMPOSSIBLE".

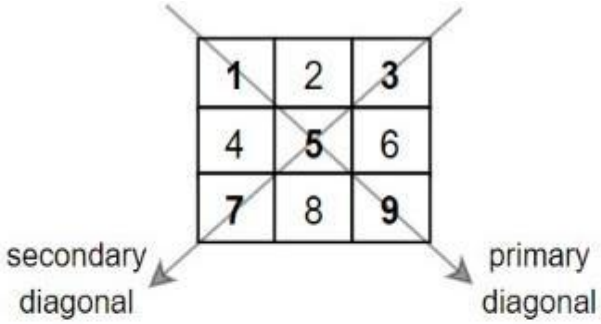
12. You are given an m x n integer matrix with the following two properties:
    Each row is sorted in non-decreasing order. The first integer of each row is greater than the last integer of the previous row. Given an integer target, return true if target is in matrix or false other wise.

1	3	5	7
10	11	16	20
23	30	34	60

Input :matrix=[[1,3,5,7],[10,11,16,20],[23,30,34,60]],target=3
Output: true

13. You are given an m x n integer grid accounts where accounts[i][j] is the amount of money the ith customer has in the jth bank. Return the wealth that the richest customer has A customer's wealth is the amount of money they have in all their bank accounts. The richest customer is the customer that has the maximum wealth.

14.Given a square matrix mat, return the sum of the matrix diagonals. Only include the sum of all the elements on the primary diagonal and all the elements on the secondary diagonal that are not part of the primary diagonal.




```
Input: mat = [[1,2,3],
              [4,5,6],
              [7,8,9]]
Output: 25
Explanation: Diagonals sum: 1 + 5 + 9 + 3 + 7 = 25
Notice that element mat[1][1] = 5 is counted only once.
```

15. Writeaprogramtoperformmatrixmultiplication.IfMultiplicationcannotbedonefora given matrices then print "NOT POSSIBLE"

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \quad B = \begin{pmatrix} 5 & 6 & 7 \\ 8 & 9 & 10 \end{pmatrix}$$

Multiplication of two matrixes:

$$A * B = \begin{pmatrix} 1*5 + 2*8 & 1*6 + 2*9 & 1*7 + 2*10 \\ 3*5 + 4*8 & 3*6 + 4*9 & 3*7 + 4*10 \end{pmatrix}$$

$$A * B = \begin{pmatrix} 21 & 24 & 27 \\ 47 & 54 & 61 \end{pmatrix}$$

Input:

1) Read the row & column sizeofmatrix1
2) Readthematrix1
3) Read the row & column sizeofmatrix2
4) Readthematrix2

Output:

Resultant Matrix.

Sample Input	Sample Output
22	710
12	1522
34	
22	
12	
34	

16. Given two sorted arrays num s1and num s2ofsizemandnrespectively,return the median of the two sorted arrays.
Input: nums1 = [1,3], nums2 = [2] Output: 2.00000
Explanation: merged array=[1,2,3] and median is 2.

17. Given a m x n grid filled with non-negative numbers, find a path from top left to bottom right, which minimizes the sum of all numbers along its path.
Note: You can only move either down or right at any point in time.

1	3	1
1	5	1
4	2	1

Input: grid=[[1,3,1],[1,5,1],[4,2,1]]
Output:7
Explanation: Because the path1→3→ 1→1→1 minimizes the um.

18. Given an array nums of size n, return the majority element. The majority element is the element that appears more than ⌊n/2⌋ times. You may assume that the majority element always exists in the array.
Input: nums=[3,2,3]Output:3

19. Given a sorted array of distinct integers and a target value, return the index if the target is found. If not, return the index where it would be if it were inserted in order.

Input: nums=[1,3,5,6],target=5Output:2

20. Givenamxnmatrixgridwhichissortedinnon-increasingorderbothrow-wise and column-wise, return the number of negative numbers in grid.

```
Input: grid = [[4,3,2,-1],[3,2,1,-1],[1,1,-1,-2],[-1,-1,-2,-3]]
Output: 8
Explanation: There are 8 negatives number in the matrix.
```

Example 2:

```
Input: grid = [[3,2],[1,0]]
Output: 0
```

Week8: String Handling

1. Louise joined a social networking site to stay in touch with her friends. The signup page required her to input a *name* and a *password*. However, the password must be *strong*. The website considers a password to be *strong* if it satisfies the following criteria:

- Its length is at least 6.
- It contains at least one digit.
- It contains at least one lower case English character.
- It contains at least one upper case English character.
- It contains at least one special character. The special

characters are: @#$%^&*()-+!

2. As pace explorer's ship crashed on Mars! They send a series of SOS messages to Earth for help.

Letters in some of the SOS messages are altered by cosmic radiation during transmission. Given the signal received by Earth as a string, determine how many letters of the SOS message have been changed by radiation.
s='SOSTOT'

Example

The original message was SOSSOS. Two of the message's characters were changed in transit.

Function Description

CompletethemarsExplorationfunctionintheeditorbelow.marsExplorationhasthefollowing parameter(s):
strings: the string as received on Earth

Returns

int: the number of letters changed during transmission

3. ChefhasastringSwithhim.Chefishappyifthestringcontainsacontiguoussubstring of length strictly greater than 2 in which all its characters are vowels.
   Determine whether Chef is happy or not.
   Note that, in english alphabet, vowels are a, e, i, o, and u.
4. Given two strings needle and haystack, return the index of the first occurrence of needle in haystack, or -1 if needle is not part of haystack.
5. Givenastringsconsistingofwordsandspaces,returnthelengthofthelast word in the string. A word is a maximal substring consisting of non-space characters only.
6. Given a string S, reverse only all the vowels in the string and return it. The vowelsare'a','e','i','o',and'u',andtheycanappearinbothlowerandupper cases, more than once.
7. You have been given a String S. You need to find and print whether this string is a palindrome or not. If yes, print "YES" (without quotes), else print "NO" (without quotes).

Skill Oriented Exercise

8. Jeff, Chef's younger brother, is learning to read and knows a subset of the Latin alphabet. Chef gave Jeff a book with N words to practice. Jeff can only read wordsthatconsistofthelettersheknows.Thetaskistodeterminewhichwords Jeff can read based on the given letters and output "Yes" or "No"

accordingly.

9. Timur loves code forces. That's why he has a string Shaving length 10made containing only lower case Latin letters. Timur wants to know how many indices string s differs from the string "codeforces".

Forexamplestrings="coolforsez"differsfrom"codeforces"in4indices,showninbold.

Up the Ladder

A man wants to reach window which is 40ft above from the ground. And the distance between the foot of the ladder and wall is 9 feet. How long should the ladder be?

10. Given two strings s and t, return true if t is an anagram of s, and false otherwise. An Anagramisawordorphraseformedbyrearrangingthelettersofadifferentword or phrase, typically using all the original letters exactly once. Given strings, find the first non-repeating character in it and return its index. If it does not exist, return -1.

11. A robot starts at the origin (0, 0) on a 2D plane. It is given a sequence of moves represented by the string "moves". Each move is represented by 'R' (right), 'L' (left), 'U' (up), or 'D' (down). The task is to determine if the robot returns to the origin after completing all the moves. The robot's direction is irrelevant, and all moves have the same magnitude. Return true if the robot ends up at the origin, and false otherwise.

12. Chandu is a bad student. Once his teacher asked him to print the reverse of a given string. He took three hours to solve it. The teacher got agitated at Chandu and asked you the same question. Can you solve it?

13. There is a string s of lowercase English letters that is repeated infinitely many times. Given an integer n find and print the number of letter a's in the first n letters ofthe infinite string.

Week9: Recursion

1. Given an integer n, return true if it is a power of three. Otherwise, return false. An integer n is a power of three, if there exists an integer x such that n == 3^x.
2. You are climbing a stair case. It takes n steps to reach the top. Each time you can either climb1or 2steps. In how many distinct ways can you climb to the top?
3. Given an integer n, return true if it is a power of four. Otherwise, return false. An integer n is a power of four, if there exists an integer x such that n == 4^x.
4. You are given an integer N. You need to print N! –the factorial of N.

Input The first line of the input contains a single integer *T* denoting the number of test cases. The description of *T* test cases follows. The first and only line of each test case contains a single integer *N*.

Output For each test case print a single line containing a single integer *N*!

5. The Fibonacci numbers, commonly denoted F(n) form a sequence, called the Fibonacci sequence, such that each number is the sum of the two precedingones,startingfrom0and 1
6. Kristenlovesplayingwithandcomparingnumbers.Shethinksthatifshetakestwodifferent positive numbers, the one whose digits sum to a larger number is *better* than the other.

If the sum of digits is equal for both numbers, then she thinks the smaller number is *better*. For example, Kristen thinks that 13is better than 31and that12is better than 11 .Given an integer, n ,can you find the divisor of n that Kristin will consider to be the best?

7. A perfect number is a positive integer that is equal to the sum of its positive divisors, excluding the number itself. A divisor of an integer x is an integer that can divide x evenly. Given a n integer n, return true if n is a perfect number, other wise return false.
8. Given an integer num, repeatedly add ll its digits until the result has only one digit, and return it.
9. **Something for Profit:** A friend of mine bought a used pressure cooker for Rs. 60. She somehow did not find it useful and so when a friend of hers offered her Rs. 70 she sold it to her. However, she felt bad after selling it and decided to buy it back from her friend' by offering her Rs. 80. After having bought it once again she felt that she did not really need the cooker. So, she sold it at the auction forRs.90.Howmuchprofitdidshemake? Did she a tall make any profit?
10. Given a signed 32-bit integer x, return x with its digits reversed. If reversing x causes the value to go outside the signed 32-bit integer range $[-2^{31}, 2^{31} - 1]$, then return 0.

11. Given an integer array num s, move all 0's to the end of it while maintaining the relative order of the non-zero elements.

12. Writeafunctionthattakesthebinaryrepresentationofanunsignedinteger and returns the number of '1' bits it has (also known as the Hamming weight).

13. Martha is interviewing at Subway. One of the rounds of the interview requires her to cut a bread of size l X b into smaller identical pieces such that each piece is a square having maximum possible side length with no leftover piece of bread.

14. Given N two-dimensional points in space, determine whether they lie on some vertical or horizontal line.

If yes, print YES; otherwise, print NO.

Skill Oriented Exercise

PREDICTTHEOUTPUT

```
#include<stdio.h>voidfoo(intn){
if(n>0){printf("%d",n);foo(n-1);printf("%d",n);
}
}
intmain(){
foo(3);return0;
}
```

1. **What is the output of the above program?**
   - 321123
   - 321
   - 123
   - 123321

```
#include<stdio.h>intbar(intn){ if (n
<= 0) { return 0;
}else{
returnn+bar(n-2);
}
}
int main(){
intresult=bar(7); printf("%d",result);return0;
}
```

2. What is the output of the above program?

- 20
- 16
- 14
- 12

```
#include<stdio.h>voidbaz(intn){ if (n >
0) {
baz(n/2);printf("%d",n%2);
}
}
intmain(){
baz(10);return0;
}
```

3. What is the output of the above program?

- 1010
- 0101
- 00101
- 1101

```
#include<stdio.h> intfactorial(intn){ if (n
== 0) { return 1;
}else{
returnn*factorial(n-1);
}
intmain(){
intresult=factorial(5); printf("%d",result);return0;
}
```

4. What is the output of the above program?

- 120
- 24
- 25
- 20

```
#include<stdio.h>
intpower(intbase,intexponent){if(exponent==0){return1;
}else{
returnbase*power(base,exponent-1);
}
}
```

```
intmain(){
intresult=power(2,4);printf("%d",result); return0;
}
```

5. What is the output of the above program?

- 16
- 8
- 32
- 64

Week10: Structures

1. You are building a pay roll system for accompany with multiple departments. Designa programusingstructuresthatstoresemployeedetailssuchasname,employeeID,and salary. Implement an array of structures to store employee records for each department. Calculate the total salary expenditure for each department and display it. Additionally, identify the department with the highest salary expenditure and acknowledge it as the top-performing department

2. VGP logistics is a premium Cargo service for Sending/receiving parcels from Vijayawada to Singapore. You are appointed as Manager in delivery department and need to maintain the arrival and delivery of the consignments sent/received. Create a structure consignment with the following Members Consignment_id, name, from, to, DOS (Date of Shipment), net weight, Address.
   For Example:
   Consignment_id:1008Name:HaierSteamerFrom:Vijayawada To: Singapore
   DOS(Date of Shipment):30-may-2023net_weight:28.8kg Address: Mint Street Chennai

3. You have been assigned the task of developing a student grading system for a prestigious college. Design a program using structures that stores student details, such as name, roll number, and marks in various subjects. Implement an array of structures to store multiple student records and calculate the overall percentage for each student. Additionally, provide a functionality to generate a grade for each student based on their percentage and display it alongside their record.

4. You are developing a soldier management system for an army unit. Each soldier's record consists of the following information: name, rank, and years of service. Implement an array of structures to store the records of multiple soldiers. Write a C program to calculate and display the average years of service for all soldiers in the unit.

5. You are working on a ship management system for a naval fleet. Each ship's record contains the following details: name, type (e.g., aircraft carrier, destroyer), and year of commissioning. Implement an array of structures to store the ship records. Write a C program to search for a specific type of ship within the fleet and display the names of all ships belonging to that type.

6. You have been assigned the task of developing a pilot roster system for an air force squadron. Each pilot's record includes the following information: name, rank, and flight hours. Implement an array of structures to store the pilot records. Write a C program to find and display the pilot with the highest number of flight hours in the squadron.

7. You are working on a reservation system for a luxurious hotel. Create a program using structures that stores guest details, including name, room number, and check-in

date. Implement an array of structures to store multiple guest records and allow the hotel staff to search for guests by either their room number or name. Provide an additional feature that calculates the duration of each guest's stay and generates the total revenue earned by

the hotel.

Skill Oriented Exercise

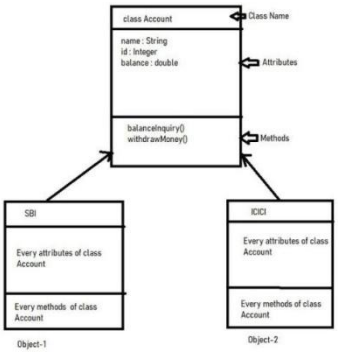
8. You have been tasked with developing a library management system for a renowned library. Create a program using structures that stores book information, including title, author, and publication year. Implement an array of structures to store multiple book records and allow the librarian to search for books by either title or author's name. Enhance the system by enabling the librarian to borrow and return books, updating the book status accordingly.

9. You have been assigned the task of creating a customer billing system using an array of structures. Each structure should store the customer's name, account number, and total amount due. Implement functions to add customer records, display all records, and find the customer with the highest amount due.

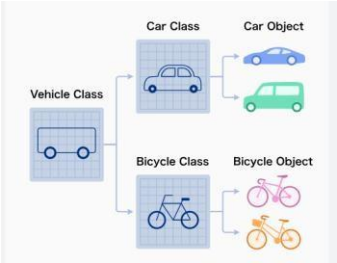
10. You are working on a car inventory management system using an array of structures. Each structure should hold the details of a car, including the make, model, and year of manufacture. Implement functions to add car records, display all records, and find the newest car in the inventory.

11. You are developing a product inventory management system for a retail store. Each product has a unique identifier, name, price, and quantity in stock. Implement an array of structures to store the product records. Create functions to add new products, update product details, display all products, and search for products based on their identifier or name.

Week11: Classand Objects:



1. Create a class and the object code for the above scenario.



2. Develop code for Class and Object.

Week12: Data Abstraction

Developing a banking application that handles various types of accounts such as savings, checking, and loans.

- **Abstraction Use:** Create abstract classes or interfaces like Account with common methods (e.g., deposit(), withdraw(), get Balance()). Concrete classes (e.g., Savings Account, Checking Account) implement these methods. The user interacts with Account objects without needing to know the specific type of account or its internal workings.

Inheritance

Developing a graphical user interface (GUI)library with various types of buttons.

- **Inheritance Use:** Create a base class Button with common properties like label, size, and methods like click(). Derive subclasses like Image Button, Toggle Button, and RadioButtonthatinheritfromButtonandaddspecificpropertiesormethodsuniqueto each type of button.

Building a ne-commerce plat form with different types of products.

- **Inheritance Use:** Define a base class Product with common attributes like name, price, and methods like apply Discount(). Create subclasses like Electronics, Clothing, and Books, each adding specific attributes (e.g., Electronics might have warrantyPeriod, Clothing might have size and color).

Skill Oriented Exercise

Building educational software that manages different types of learning resources.

- **Inheritance Use:** Establish a base class Learning Resource with common properties like title, subject, and methods like display(). Derive subclasses such as Book, Video Lecture, and Quiz, each adding specific attributes and methods (e.g., Quizmight have questions and a method evaluate()).

Designing a system to classify and manage information about different animals.

- **Inheritance Use:** Define a base class Animal with common attributes like name, habitat, and methods like eat(), sleep(). Create subclasses such as Mammal, Bird, and Reptile, each with specific characteristics and methods(e.g., Bird might have methods fly()).

Week13: Polymorphism

An application that can draw various shapes such as circles, rectangles, and triangles.

- **Polymorphism Use:** Define an abstract class Shape with a method draw(). Implement subclasses Circle, Rectangle, and Triangle, each providing its specific draw() implementation. The application can then handle any shape object through the Shape interface

A program that simulates sounds of different animals.

- **Polymorphism Use:** Create a base class Animal with an abstract method make Sound(). Implement subclasses Dog, Cat, and Cow that override make Sound(). The simulator can then invoke make Sound() on any animal object

Managing different types of transportation such as cars, buses, and bicycles.

Skill Oriented Exercise

- **Polymorphism Use:** Define a base class Vehicle with an abstract method move(). Implement subclasses Car, Bus, and Bicycle, each with its own implementation of move(). The system can then manage different vehicles uniformly

A system sending notifications via email, SMS, and push notifications.

- **Polymorphism Use:** Define an abstract class Notification with a method send(). Implement subclasses Email Notification, SMS Notification, and Push Notification, each with its own send() method. The system can send notifications through any medium using the same interface

Week14: Virtual functions

A document edit or that supports different types of documents such as text documents, spreadsheets, and presentations.

- **Virtual Function Use:** Define a base class Document with a virtual function save(). Subclasses Text Document, Spreadsheet, and Presentation override save() to handle specific saving mechanisms.

Anaudioprocessinglibrarythathandlesvariousaudioeffectssuchasreverb,echo,and distortion.

Skill Oriented Exercise

- **Virtual Function Use:** Define a base class Audio Effect with a virtual function apply().SubclassesReverbEffect,EchoEffect,andDistortionEffectoverrideapply() to implement specific effects.

An AI strategy game that involves different types of game characters such as warriors, mages, and archers.

- **Virtual Function Use:** Define a base class Character with a virtual function attack(). Subclasses Warrior, Mage, and Archer override attack() to provide specific attack behaviors.

Week15: Exception handling

1) File Operations Scenario: An application needs to read data from a file. Exception Handling Use: Implement code to handle scenarios where the file might not exist, the

application lacks permissions, or the file is corrupted. Use try-catch blocks to manage these exceptions:

2) E-Commerce Checkout Process

Scenario:Ane-commerceapplicationprocessesuserordersduringcheckout.

- Exception Handling Use: Handle errors such as invalid payment details, out-of-stock items, or delivery address issues.

Skill Oriented Exercise

3)An application processes images for various operations like resizing, filtering, and saving.

- Exception Handling Use: Handle errors such as unsupported file formats, corrupted files, or out-of-memory issues.

TEXTBOOKS:

1. ForouzanB.A&RichardF.Gilberg,A Structured ProgrammingApproachusingC,3rd Edition(2013), Cengage Learning.
2. JeriR.HanlyandElliotB.Koffman,ProblemsolvingandProgramDesigninC7th Edition, Pearson
3. ANSI and Turbo C++by Ashoke N.Kamthane, Pearson Education

REFERENCES:

1. BrianW.KernighanandDennisM.Ritchie,TheCProgrammingLanguage,PrenticeHall of India
2. E.Balagurusamy,ComputerfundamentalsandC,2ndEdition,McGraw-Hill
3. YashavantKanetkar,LetUsC,18thEdition, BPB
4. E.Balagurusamy,ObjectOrientedProgrammingusingC++,2ndEdition,McGraw-Hill

24X0073: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

B.Tech. I Year. II Sem.

L	T	P	C
0	0	2	1

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

Course Objective

- ✓ To facilitate computer-assisted multi-media instruction enablingindividualized and independent language learning
- ✓ To sensitize the students to the nuances of English speech sounds, wordaccent, intonation and rhythm
- ✓ To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- ✓ To improve the fluency of students in spoken English and neutralize theimpact of dialects.
- ✓ To train students to use language appropriately for public speaking,group discussions and interviews

Course Outcomes: Students will be able to:

- ✓ Understand the nuances of the English language through audio-visual experienceand group activities
- ✓ Neutralize their accent for intelligibility
- ✓ Speak with clarity and confidence which in turn enhances their employability skills

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

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

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

Listening Skills:

Objectives

1. To enable students to develop their listening skills so that they may appreciate therole in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speech of people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and to recognize and use the right intonation in sentences.

- Listening to general content
- Listening to fill up information
- Intensive listening
- Listening to specific information

Speaking Skills:

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students to express themselves fluently and appropriately in social andprofessional contexts

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities
- Just A Minute (JAM) Sessions

The following course content is prescribed for the **English Language and Communication Skills Lab**.

Exercise – ICALL Lab:

Understand Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. *Practice*: Introduction to Phonetics – Speech Sounds – Vowels and Consonants

– Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *TestingExercises*

ICS Lab:

Understand: Spoken vs. Written Language- Formal and Informal English.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave

– Introducing Oneself and Others.

Exercise –

IICALL

Lab:

Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress

pattern insentences – Intonation.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stresspattern in sentences – Intonation - *Testing Exercises*

ICS Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication. *Practice:* Situational Dialogues – Role Play- Expressions in Various Situations –MakingRequests and Seeking Permissions - Telephone Etiquette.

Exercise - III

CALL Lab:

Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).

Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -*Testing Exercises*

ICS Lab:

Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing

Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise – IVCALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests - *Testing Exercises*

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks - Non-verbalCommunication- Presentation Skills.

Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise – V

CALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests -*Testing Exercises*

ICS Lab:

Understand: Group Discussion

Practice: Group Discussion

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:**

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self-study by students.

System Requirement (Hardware component):

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

i) Computers with Suitable Configuration

ii) High-Fidelity Headphones

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

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

Source of Material (Master Copy):

- *Exercises in Spoken English. Part 1,2,3*. CIEFL and Oxford University Press

Note: Teachers are requested to make use of the master copy and get it tailor-made to suit thecontents of the syllabus.

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) CambridgeUniversity Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) CambridgeUniversity Press.

- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All
- Orell Digital Language Lab (Licensed Version)

REFERENCE BOOKS:

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook.* Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook.* Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook.* OxfordUniversity Press
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.* Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach.* Cambridge University Press.

2410596: WEB APPLICATION DEVELOPMENT

B.Tech. I Year. I Sem

L	T	P	C
0	0	2	1

COURSE OBJECTIVES: The students will try to learn

- HTML tags
- CSS
- Development of static web site
- Concepts of Java script
- Development of dynamic web site

0 0 2 1

COURSE OUTCOMES: After successful completion of the course, students should be able to

- Learn HTML tags and CSS
- Develop static web pages using HTML
- Use CSS in web pages
- Understand basic concepts of Javascript
- Develop dynamic web pages

PART-A

1. Write a HTML program to create a webpage about the different art forms of India, with appropriate title on the title bar. Use different heading tags for the headings, and list them using ordered list.
2. Write a HTML program to create sections in the document using appropriate tags and apply different color as background to them. Use internal hyperlinks to move to differentpoints within the page.
3. Write a HTML program to insert a picture on the webpage, giving description for the picture in a paragraph. Use properties of height, width, hspace, vspace and align, with different values.
4. Write a HTML Program, to create a profile of 2 pages, the First page containing the applicant's picture with personal details using unordered lists, and the second containingEducational details using tables. Use hyperlinks to move to the next page.
5. Using Frames create an Indian Flag and insert the image of chakra in the center.
6. Create a frame like structure based on the given diagram, such that When the first link is clicked, the contents of the first frame is filled with the corresponding information and when the second link is clicked the second frame is filled.

• Networks • Simulation	Networks…….. Simulation

7. Write a program in HTML to demonstrate the concept of Image map, for India map.Map for areas rectangle, Circle and polygon.

PART-B

1. Write a program using Javascript to do the multiplication table for a number entered bythe user in the textbox.
2. Create a sparse array using the values entered by the user in the five textboxes, and useArray methods such as sort(),pop(),push(), reverse() and join().
3. Create a Math object and use methods ceil(),floor(), round() for rounding off thenumber, also use methods such as cos(), sin(),sqrt().
4. Write a Program using Javascript to print a bill for 5 items purchased by the user.
5. Write a program Using Date object, to display appropriate greeting message "Good Morning" or "Good Afternoon" or "Good Night", in an alert box with the user's name, after receiving the same in the prompt box.
6. To demonstrate the concept of styles, Write a program applying internal style for paragraph tag, and override the same by applying inline style. Also create an external CSS file applying styles for the headings.
7. Create a registration form for creating an email account, having the input type elements like checkbox, radio button, select option, text area and submit button, and validate the textboxes for verifying the password.
8. Create a web page using two image files, which switch between one another as the mouse pointer moves over the image. Use on Mouse Out and on Mouse Over event handlers.
9. Using filters apply opacity feature to blur the image and using Transition apply hover feature, so the image will be transparent again when the mouse pointer is placed on the image.

I-II

2420002: DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(CSE, CSD, CSM, ECE, EEE, MECH, CIVIL)

I Year B.Tech. II Sem. **L T P C**

3 1 0 4

Course Overview:

This course plays a crucial role in engineering, serving as the foundation upon which engineers build and apply their knowledge to solve real world applications. It presents a systematic and comprehensive introduction to ordinary differential equations and vector calculus for engineering students .Mathematical concepts and various techniques are presented in a clear logical and concise manner. A linear differential equation is used to regulate the flow of electricity in various electrical circuits like LR, LCR and CR circuits. Vector calculus is extensively used in the description of electromagnetic fields, gravitational fields and fluid flow.

Pre-requisites: Mathematics courses of 10+2 year of study.

Course Objectives: The student will try to learn

- Methods of solving the differential equations of first order and first degree.
- Concept of higher order liner differential equations.
- Concept, properties of Laplace transforms, solving ordinary differential equations by using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions.
- The basic properties of vector valued functions and their applications to line, surface and volume integrals.

Course outcomes: After successful completion of the course, students should be able to

CO1: Identify whether the given first order differential equation is exact or not.

CO2: Solve higher differential equation and apply the concept of differential equation to real world problems.

CO3: Usethe Laplace transforms techniques for solving ODE's.

CO4: Apply the Del operator to scalar and vector point functions.

CO5: Evaluate the line, surface and volume integrals and converting them from one to another.

UNIT-I: First Order ODE 10L

Exact differential equations, equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II: Ordinary Differential Equations of Higher Order 10 L

Second order linear differential equations with constant coefficients: Non-Homogeneous

terms of the type e^{ax}, sin ax,cos ax, polynomials in x, $e^{ax}V(x)$ and x V(x), method of variation of parameters, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

UNIT-III: Laplace transforms 10 L

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

UNIT-IV: Vector Differentiation 8 L

Vectorpointfunctionsandscalarpointfunctions,Gradient,DivergenceandCurl,Directionalderivatives, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

UNIT-V:Vector Integration 10 L

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

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition,2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition,2016.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9thEdition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. H. K. Dass and Er. RajnishVerma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

24X0009: ENGINEERING CHEMISTRY

B.Tech I Year II Sem **L T P C**

3 1 0 4

Course overview:

1. **Importance of course-** It helps engineers understand the nature of different materials. It also helps engineers learn how to work with different types of matter without causing pollution or waste.

2. **Brief about course-** To impart knowledge on the fundamental concepts of chemistry

   Involved in application of several important engineering materials that are used in Industry/day to day life**.**

3. **Applications of course:** Engineering chemistry graduates use raw materials and chemicals to design, manufacture, and test new products, systems and machinery which are used in numerous industries.

Prerequisites: chemistry knowledge at Pre- University level

Course Objectives: The students will try to learn

1. Knowledge about desalination of brackish water and treatment of municipal water.
2. Fundamental aspects of battery chemistry, significance of corrosion its control to protect the structures.
3. Knowledge of polymers, conducting polymers, bio-degradable polymers and fiber reinforced plastics.
4. Basic concepts of petroleum and its products.
5. Knowledge about engineering materials like cement, smart materials and Lubricants.

Course Outcomes: After successful completion of the course, students should be able to

1. Apply softness of water by ion exchange process.
2. Analyze the various types Factors affecting of corrosion.
3. Understand the fundamental concepts of polymers
4. Analyze the various type of Gaseous Fuels.
5. Evaluate the smart materials and their Applications.

Course articulation matrix

PO/PSO/CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	4	2	1	-	-	1	-	-	-	-	1	1	-
CO2	2	4	3	4	2	1	1	1	-	-	-	1	1	-
CO3	1	2	1	2	1	2	1	-	-	-	-	1	1	-
CO4	1	4	4	5	1	2	1	-	-	-	-	1	1	-
CO5	1	4	4	5	1	2	1	-	-	-	-	1	1	-

UNIT - I: Water and its treatment: [8]

Introduction to hardness of water – Estimation of hardness of water by complex ometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water-Disinfection of potable water by chlorination and break-point chlorination.

Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange processes. Desalination of Brackish water – Reverse osmosis.

UNIT – II Battery Chemistry & Corrosion [8]

Introduction-Classification of batteries-primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell.

Construction and applications of Hydrogen Oxygen fuel cell. Solar cells - Introduction and applications of Solar cells.

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion mechanism of electrochemical corrosion,

Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods. Surface coatings-Metallic coatings-Hot dipping-Galvanisation, Tinning

UNIT - III: Polymeric materials: [8]

Definition – Classification of polymers with examples – Types of polymerization–addition (Mechanism of free radical addition) and condensation polymerization with examples – Nylon 6:6.

Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC ,Teflon, Fiber reinforced plastics (FRP).

Rubbers: Natural rubber and its vulcanization.

Elastomers: Characteristics –preparation – properties and applications of Buna-S,Thiokol rubber.

Conducting polymers: Characteristic, Classification and applications of conducting polymers.

Biodegradable polymers: Concept and advantages - Poly vinyl alcohol and their applications.

UNIT - IV: Energy Sources: [8]

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

UNIT - V: Engineering Materials: [8]

Cement: Portland cement, its composition, setting and hardening, special cements-white cement, waterproof cement, high alumina cement.

Smart materials and their applications:-

Classification-(piezoelectric materials-quartz, Shape memory material (SMA-Nitinol), Thermoresponsive materials, magneto rheological materials-Examples.

Lubricants: Classification of lubricants with examples-characteristics of a good lubricants-

mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010.
2. Engineering Chemistry by Rama Devi, and Rath, Cengage learning, Second edition 2022.
3. Textbook of Engineering Chemistry by Jaya Shree Anjireddy, Wiley Publications,2022.
4. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.
5.

REFERENCE BOOKS:

4. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
5. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi(2011)

24X0321: APPLIED MECHANICS
(Common to Mechanical & Civil)

B.Tech.I Year II Semester

L	T	P	C
3	0	0	3

Course Overview:

Engineering mechanics is the basic course which is useful for the engineering students, studying of the subject helps to develop the thinking, analytical ability and imagination, skills of the student .This course covers a essential topics such as equilibrium system of forces, friction, centroids and centre of gravity, moment of inertia, trusses and work energy. This course principles apply for manufacturing of various products and projects such as automobiles, railways, bridges, dam, power transmission towers, etc.

Prerequisite: Nil

Course Objective: The students will be able

- To solve resultant of any force system.
- To analyze the types of friction for moving bodies and problems related to friction.
- To determine the centroid of an area and centre of gravity of a body.
- To understand the concept of trusses and virtual works.
- Understand the work energy principle.

Course Outcomes: Upon successful completion of this course, students will be able to:

- Determine the resultant forces acting on a body and analyze equilibrium of a body subjected to a system of forces.
- Solve problem of bodies subjected to friction.
- Find the location of centroid and calculate moment of inertia of given section.
- Determine the forces in the member of the trusses.
- Solve the problem using work energy equations for translation, fixed axis rotation and plane motion of rigid bodies.

Module-I: Introduction to Engineering Mechanics
[10]

Basic Concepts, system of Forces Coplanar Concurrent Forces -Components in Space - Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

Module-II: Friction, Centroid and center of Gravity
[08]

Types of friction -Limiting friction -Laws of Friction -static and Dynamic Frictions – Types of friction – Dry friction – Ladder friction – Wedge friction – Screw friction – Centroid and centre of gravity- Centroid of lines, Areas and volumes from First principle, Centroids of composite sections; Centre of gravity and its implications.

Module -III: Area of Moment of Inertia and Mass Moment of Inertia.

[10]

Introduction – Definition of Moment of Inertia of plane sections from first principle, Theorems of moment of inertia – Moments of inertia of standard sections and Moments of Inertia of Composite sections; Product of Inertia. Parallel axis theorem, Perpendicular axis theorem, Mass moment of Inertia, Inertia of masses- Mass moment of inertia of composite bodies.

Module -IV: Analysis of trusses and Virtual work

[10]

Introduction, Classification of trusses, Assumptions made in the analysis of perfect truss, methods of Trusses-Methods of Joint and Methods of sections. Principle of virtual work: Equilibrium of ideal systems, efficiency of simple machines, stable and unstable equilibriums

Module –V: Review of partical dynamics:

[10]

Rectilinear motion, Plane curvilinear motion(rectangular, path and polar coordinates). 3-D curvilinear motion, relative and constrained motion; Newton's 2nd law (rectangular, path and polar coordinates), D'Alemberts Principle, Work-Kinetic energy, power, potential energy. Impulse-momentum (linear, angular) Impact (Direct and oblique)

Text Books:

1. Reddy Vijay Kumar K. and J.Suresh Kumar (2010),Singer's Engineering Mechanics -Statics & Dynamics.
2. A.Nelson, "Engineering Mechanics: Statics & Dynamics", Tata McGraw-Hill Education, 2009.

Reference Books:

1. Timoshenko S.P & Young D.H "Engineering Mechanics" McGraw-Hill international Edition,1983
2. A.K Thayal, Engineering Mechanics Uma Publications 14th edition,2013
3. R.k. Bansal Engineeing Mechanics , laxmi Publications 8th edition.2013

24X0502: Essentials of Problem Solving Using Python

B.Tech. I Year II Sem.

L	T	P	C
3	0	0	3

Course Overview:

This course gives acquaintance to Python Programming and Graph Theory. The course deals with Python programming concepts and concepts in graph theory like properties of standard graphs, Eulerian graphs, Hamiltonian graphs, Chordal graphs, Distances in graphs, Planar graphs, graph connectivity and Colouring of graphs.

Graph theory is used in Network Topologies and Routing Algorithms, Algorithm Design, Social Network Design, Logistics.

Prerequisites:

- A course on "Problem solving using C and C++".

Course Objectives: The students will try to learn

- Basic building blocks of python
- Using of Functions and Modules
- Importance of Multithreading in problem solving
- The fundamental concepts of graph theory
- Graph coloring and traversal algorithms for solving real-world problems

Course Outcomes: After successful completion of the course, students should be able to

- Construct Python data structures programs using tuples sets and dictionaries
- Design Programs using Functions and Modules
- Implement Multithread concept in solving problems
- Understand graph terminology
- Build efficient graph routing algorithms for various optimization problems on graphs.

Module-I **[10]**

Python Basics: Python Objects, Operators, Python Numbers, Operators, Built-in Functions. Conditionals and Loops-if, else, elif, for, while, break, continue, pass**.**

Sequences: Strings, Lists, and Tuples- Built-in Functions, Special features.

Mapping and Set Types: Dictionaries, Sets.

Module –II **[9]**

Functions and Functional Programming –Calling Functions , Creating Functions, Passing Functions , Formal Arguments, Variable-Length Arguments, Functional Programming.

Modules–Modules and Files, Namespaces, Importing Modules, Module Built-in Functions, Packages, Related modules.

Module –III **[8]**

Files and Input / Output: File Objects, File Built-in Functions, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments.
Multithreaded Programming: Introduction, Threads and Processes, Python Threads, the Global Interpreter Lock, Thread Module, Threading Module.

Module -IV **[8]**

Graph terminology, Digraphs, Weighted graphs, Complete graphs, Graph complements, Bipartite graphs, Graph combinations, Isomorphism's, Matrix representations of graphs, incidence and adjacency matrices, Degree Sequence, Eulerian circuit: Konigsberg bridge problem, Touring a graph; Eulerian graphs, Hamiltonian cycles

Module – V **[7]**

Shortest paths: Dijkstra's algorithm, Walks using matrices.
Graph Coloring And Graph Algorithms: Four color theorem, Vertex Coloring, Edge Coloring, Coloring Variations.
Graph traversal: Depth-First Search, Breadth-First Search and its applications; The traveling salesman problem, Minimum Spanning Trees: Kruskal's and Prim's algorithm

TEXTBOOKS:

1. Core Python Programming, Wesley J. Chun, Third Edition, Prentice Hall PTR
2. Karin R Saoub, Graph Theory: An Introduction to Proofs, Algorithms, and Applications, 1 st edition, Chapman and Hall, 2021.

REFERENCES:

1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, VamsiKurama, Pearson
4. Learning Python, Mark Lutz, O'Really
5. R Balakrishnan, K Ranganathan, A Textbook of Graph Theory,Springer Exclusive, 2 nd edition, 2019.

24X0371: COMPUTER AIDED ENGINEERING GRAPHICS
(Common to All Branches)

B.Tech I Year II Semester

L	T	P	C
1	0	4	3

Course Overview:

Engineering Graphics is a foundational course designed to introduce first-year engineering students to the principles and practices of technical drawing and computer-aided design (CAD). This course covers essential topics such as geometric construction, orthographic projection, isometric drawing, lettering and dimensioning. Students will develop skills to create and interpret engineering drawings and gain proficiency in using CAD software for engineering applications.

Prerequisite: NIL

Course Objective: The students will be able

1. To understand the importance of engineering graphics in the engineering design process.
2. To apply principles of dimensioning and lettering in engineering drawings
3. To develop the ability to create and interpret technical drawings.
4. To master geometric constructions and projections.
5. To gain proficiency in computer-aided design (CAD) software.

Course Outcomes: Upon successful completion of this course, students will be able to:

1. Explain the role of engineering graphics in the engineering design and manufacturing process.
2. Understand the fundamental concepts of AutoCAD.
3. Perform basic geometric constructions and create accurate technical drawings.
4. Develop skills to create 2D and 3D drawings.
5. Use CAD software to create, modify, and manage engineering drawings.

Module-I: **Introduction to Engineering Graphics:** [12]

The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line, The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.

Module-II: Conic Sections and Engineering Curves
[10]

Construction of Ellipse, Parabola, Hyperbola (General Method Only)
Engineering Curves: Cycloids, Epicycloid and Hypocycloid

Module -III: Orthographic Projections
[12]

Introduction to Projections: Assumptions, Principles and Different angles of projections.
Projections of Points: Located in all Quadrants
Projections of Lines: Parallel, Perpendicular, Inclined to one plane.

Module -IV: Projections of Planes and Projection of Solids [10]

Projections of Planes: Introduction to planes, Regular lamina- Orientations- Surface parallel to HP, Surface parallel to VP, Inclined to HP, Inclined to VP.

Projections of Solids: Introduction to solids, Right Regular Solids- Orientations- Axis perpendicular to HP, Axis perpendicular to VP, Axis inclined to HP, Axis inclined to VP.

Module –V: Isometric Drawing and Conversions

[14]

Principles of Isometric projections, Isometric View and Isometric Scale, Isometric view of: Planes and Solids, Conversion: Isometric to Orthographic and Vice Versa

Text Books:

1. **"Engineering Drawing",** N.D. Bhatt,Charotar Publishing House Pvt. Ltd, 53rd Edition, 2014, ISBN: 978-9380358173
2. **"Textbook of Engineering Drawing",** K. Venkata Reddy, BS Publications, Revised Edition, 2013, ISBN: 978-9381075994
3. "**Engineering Graphics**", K.R. Gopalakrishna, Subhas Stores, 32nd Edition, 2014, ISBN: 978-9353460206
4. "**Engineering Drawing and Computer Graphics",** M B Shah & C. Rana, Pearson Edition 2010.

Reference Books:

1. "**A Textbook of Engineering Drawing**", R.K. Dhawan, S. Chand Publishing, Revised Edition, 2012, ISBN: 978-8121914311
2. "**AutoCAD 2024: A Problem-Solving Approach, Basic and Intermediate**", Sham Tickoo, CADCIM Technologies, 1st Edition, 2023, ISBN: 978-1640571577
3. "**Engineering Drawing and Graphics Using AutoCAD**", T. Jeyapoovan, Vikas Publishing House 2nd Edition, 2015, ISBN: 978-9325982417

24X0072: ENGINEERING CHEMISTRY LAB

B.Tech. I Year. II Sem **L T P C**

0 0 2 1

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry, potentiometry methods.
- Students will learn to prepare polymers such as Bakelite and Thiokol rubber in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

Course Outcomes: The experiments will make the student gain skills on:

- Determination of parameters like hardness of water
- Able to perform methods such as conductometry, potentiometry and in order to find out the concentrations or equivalence points of acids and bases.
- Students are able to prepare polymers like bakelite and Thiokol rubber.
- Estimations saponification value, surface tension and viscosity of lubricant oils.

List of Experiments:

I. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry method.

II. **Conductometry:** 1.Estimation of the concentration of an strong acid by Conductometry.

III. **Potentiometry:** Estimation of the amount of Fe^{+2} by Potentiomentry.

IV. **Dichrometry:** Determination of Ferrous ion by Dichrometry

V. **Preparations:**

1. Preparation of Thiokol rubber

VI. **Lubricants:**

1. Estimation of acid value of given lubricant oil.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

VII. **Preparation of Hand sanitizer(Iso propyl alcohol)**

VIII. **Virtual lab experiments**

1. Construction of Fuel cell and its working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

2420176 – ELEMENTS OF CIVIL ENGINEERING

B. Tech. I Year II Sem

L	T	P	C
0	0	2	1

Prerequisites:Nil

I. COURSE OVERVIEW:

The construction materials and Engineering geology introduces students to materials used in different construction projects can be tested and identification of different types of rocks and minerals. This course helps to develop students skills in identification of minerals and rocks, testing materials such as cement, coarse aggregate and fine aggregate.

II. COURSE OBJECTIVES:

The objectives of the course are

1. To provide practical knowledge about physical properties of minerals and rocks.
2. To determine the characteristics of cement**,** Coarse & Fine aggregates.

III. COURSE OUTCOMES:

At the end of the course the student will able to

1. Understand the method and ways of investigations required for Civil Engineering projects
2. Identify the various types of minerals
3. Identify the various types of rocks
4. Evaluate the properties of cement and determine its suitability for construction.
5. Evaluate the properties of fine and coarse aggregates and determine its suitability for construction.

IV. SYLLABUS:

List of Experiments:

1. **Identification of Minerals** – Silica Group, Feldspar Group, Crystalline Group, Carbonate Group, Pyroxene Group, Mica Group, Amphibole Group.
2. **Identification of Rocks –** Igneous Petrology, Sedimentary Petrology, Metamorphic Petrology.
3. a. StudyoftopographicalfeaturesfromGeologicalmaps.Identificationofsymbolsinmaps.
   b. Simple structural Geology Problems (Folds, Faults & Unconformities)
4. **Tests on Cement**
   a. Fineness test & Normal Consistency test.
   b. Specific gravity test, Initial and Final setting time of cement.
5. **Tests on Fine Aggregates**
   a. Specific Gravity test.
   b. Bulking of sand & Fineness modulus of Fine aggregate.
6. **Tests on Coarse Aggregate**
   a. Specific Gravity test.
   b. Fineness modulus of Coarse aggregate.

VI. TEXT BOOK:

1. IS 383:1993 "Specifications for Coarse and Fine Aggregates from Natural Sources for Concrete".

24X0572:Essentials Of Problem Solving Using Python Laboratory

B.Tech. I Year II Sem.

L	T	P	C
0	0	2	1

Course Overview:
This course gives acquaintance to Python Programming and Graph Theory. It deals with Python programming concepts and concepts in graph theory like properties of standard graphs, Eulerian graphs, Hamiltonian graphs, Chordal graphs, Distances in graphs, Planar graphs, graph connectivity and Colouring of graphs. Python programming is used developing machine learning and data science applications. Graph theory is used in Network Topologies and Routing Algorithms, Algorithm Design, Social Network Design, Logistics.

Prerequisites:

- A course on "Problem solving using C and C++".

Co-Requisites: Essentials of problem solving

Course Objectives: The students will try to learn

- Basic building blocks of python
- Using of Functions and Modules
- Importance of Multithreading in problem solving
- The fundamental concepts of graph theory
- Graph coloring and traversal algorithms for solving real-world problems

Course Outcomes: After successful completion of the course, students should be able to

- Construct Python data structures programs using tuples sets and dictionaries
- Design Programs using Functions and Modules
- Implement Multithread concept in solving problems
- Understand graph terminology
- Build efficient graph routing algorithms for various optimization problems ongraphs.

Week 1: Python Numbers

a) You are developing a program to determine whether a given year is a leap year, usingthe following formula: a leap year is one that is divisible by four, but not by one hundred, unless it is also divisible by four hundred. For example, 1992, 1996, and 2000 are leap years, but 1967 and 1900 are not. The next leap year falling on a century is 2400.

b) You are developing a program to determine the greatest common divisor and least common multiple of a pair of integers.

c) You are developing a program to create a calculator application. Write code that will take

two numbers and an operator in the format: N1 OP N2, where N1 and N2 are floating point or integer values, and OP is one of the following: +, -, *, /, %, **, representing addition, subtraction, multiplication, division, modulus/remainder, and exponentiation,respectively, and displays the result of carrying out that operation on the input operands.

Hint: You may use the string split() method, but you cannot use the exal () built-in function.

Skill Oriented Exercise

1. The cricket World Cup has started in Chefland. There are many teams participating in the group stage matches. Any team that scores 12 or more points in the group stage matches qualifies for the next stage.

2. The elections in Chefland have concluded, and the results are conducted. Chef received X votes, and his rival Chefu received Y. Chef thinks he dominated the election if and only if he received at least double the number of votes Chefu received. Did Chef dominate the election?

3. Bob has an account in the Bobby Bank. His current account balance is W rupees. Each month, the office in which Bob works deposits a fixed amount of X rupees to his account. Y rupees is deducted from Bob's account each month as bank charges. Find his final account balance after *Z* months. Note that the account balance can be negative as well.

4. You're a bit all over the place as a college student. You used to eat out at expensive restaurants almost every day until your parents gave you a talking-to about being irresponsible. Now, you've got to control your eating and spending habits. So, here's the plan: you'll stick to the college mess for your meals every day, except Sundays. On Sundays, you're treating yourself to those fancy restaurant meals. The cost is Rs.X for the mess food each day, and Rs. Y for the restaurant splurges. Now, what's the cost of food per week? Note that you don't have to pay for the mess on Sundays. (A week has seven days, as usual.)

Week 2: ***Control Flow***

a) Write a Program for checking whether the given number is a prime number ornot.
b) Write a program to print Fibonacci series upto given n value.
c) Write a program to calculate factorial of given integer number.
d) Write a program to calculate value of the following series $1+x-x^2+x^3-x^4+ x^n$.
e) Write a program to print Pascal triangle.

Skill Oriented Exercise

1. Charlie is 17 years old and is eager to vote. Write a Python program to check if he meetsthe legal voting age of 18.

2. Your friend given a list of numbers to you and asked to find out the largest numberamong them. Write a python program to find the largest number.

3. Daemon don't like the multiples of 7 so help him to write a Python program that printsnumbers from 1 to 30 but skip the number if it encounters multiple of a 7.

4. Bob has an account in the Bobby Bank. His current account balance is W rupees. Each month, the office in which Bob works deposits a fixed amount of X rupees to his account.Y rupees is deducted from Bob's account each month as bank charges. Find his final account balance after *Z* months. Note that the account balance can be negative as well.

Week-3 Python Sequences

a) Write a program to sort the numbers in ascending order and strings in reverse alphabetical order.
b) Given an integer value, return a string with the equivalent English text of each digit. For example, an input of 89 results in "eight-nine" being returned. Write a programto implement it.

c) Write a program to create a function that will return another string similar to the input string, but with its case inverted. For example, input of "Mr. Ed" will result in "mR.eD" as the output string.
d) Write a program to take a string and append a backward copy of that string, makinga palindrome.

Skill Oriented Exercise

1. Alice loves quotes. Write a Python program to count the number of characters in her favorite quote: "To be or not to be, that is the question.".
2. Emily wants to know if her friends name is a palindrome. Write a Python program to check for a name is a palindrome.
3. Charlie just read a new book and wants to add it to his set of favorite books {"The Hobbit", "Harry Potter"}. Write a Python program to add "The Great Gatsby" to Charlie's set and print the updated set.
4. You have a list of friends' ages: [25, 22, 29, 24]. Write a Python program to sort this listin ascending order.

Week-4 Python Dictionaries

a) Write a program to create a dictionary and display its keys alphabetically.
b) Write a program to take a dictionary as input and return one asoutput, but the valuesare now the keys and vice versa.
c) Given a List, extract all elements whose frequency is greater than K.Ex: Input test_list = [4,6,4,3,3,4,3,4,3,8], k=3

Output =[4,3]

Skill Oriented Exercise

1. You have a dictionary of your friends' favorite fruits: {"Alice": "Apple", "Bob": "Banana", "Charlie": "Cherry"}. Write a Python program to print Bob's favorite fruit.

2. John manages a small store and needs a program to track his product inventory. Write a Python program that will help John Creating the dictionary which contains the name and

price of the product and print the maximum product name along with its price.

Week-5 Files

a) Write a program to compare two text files. If they are different, give the line andcolumn numbers in the files where the first difference occurs.

b) Write a program to compute the number of characters, words and lines in a file.

Skill Oriented Exercise

1. Alice wants to list all files in her current directory. Write a Python program to import theos module and use it to print the names of all files in the current directory.
2. Charlie wants to read the contents of books.txt line by line and print each book name.Write a Python program to open the file and use the readline method to print each line.
3. Write a Python program greet.py that takes a name as a command-line argument andprints "Hello, [name]!". Demonstrate how to run it with the argument "Alice".

Week- 6&7 Functions

a) Write a function ball collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

If (distance between two balls centers) <= (sum of their radii) then (they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.

c) Write simple functions max2() and min2() that take two items and return the larger and smaller item, respectively. They should work on arbitrary Python objects. For example, max2 (4, 8) and min2(4, 8) would each return 8 and 4, respectively.

d) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.

e) Write a function dups to find all duplicates in the list.

f) Write a function unique to find all the unique elements of a list.

g) Write a function cumulative_ product to compute cumulative product of alist of numbers.

h) Write a function reverse to reverse a list. Without using the reverse function.

i) Write function to compute GCD, LCM of two numbers. Each functionshould n't exceed one line.

Skill Oriented Exercise

1. Alice wants to create a reusable function to greet her friends. Write a Python function greet that takes a friend's name as an argument and prints a greeting. Call the function with the name "Bob."

2. Charlie needs a function that can sum any number of arguments. Write a function sum_numbers that takes a variable number of arguments and returns their sum. Use thisfunction to sum 1, 2, 3, and 4.
3. Alice wants a quick way to increment a number by 1. Write a lambda function that takesa number and adds 1 to it. Use this lambda to increment 7.
4. Bob has written a custom module called mymath.py with a function add(a, b) that returns the sum of a and b. Write a Python program to import this module and use the add function to add 3 and 5.

Week- 8 Multithreading

a) Write a program to create thread using thread module.
b) Write a program to create thread using threading module.
c) Write a Program to use Python's threading module to calculate the square and cube of anumber concurrently.

Skill Oriented Exercise

1. Alice wants to perform two tasks simultaneously: counting numbers and printing messages. Write a Python program to create two threads, one for counting from 1 to 5 and another for printing "Hello" five times.
2. Charlie is learning about the Global Interpreter Lock (GIL). Write a Python program demonstrating how GIL affects multi-threaded CPU-bound tasks by incrementing a counter in two threads.
3. Diana wants to print numbers in a separate thread using the thread module. Write a Python program to print numbers from 1 to 5 in a new thread.
4. Emily needs a background thread to print a heartbeat message every second. Write a Python program to create a daemon thread that prints "Heartbeat" every second.
5. Alice is managing a shared resource. Write a Python program where two threads increment a shared counter using a threading.Lock to avoid race conditions.

Week 9:

a) Write a Python program to implement Euler Circuit.
b) Write a Python program to implement Dijkstra's algorithm.
c) Given a connected graph G with N nodes and M edges (edges are bi-directional). Every node is assigned a value $[i]$. We define a value of a simple path as :

Value of path = Maximum of (absolute difference between values of adjacent nodes in a path). A path consists of a sequence of nodes starting with start node S and end node E.

$S-u1-u2-....-E$ is a simple path if all nodes on the path are distinct and $S,1,u2,...,E$ are nodes in G.

Given a start node S and end node E, find the minimum possible ***"valueofpath"*** which starts with node S and ends with node E.

d) Yatin created an interesting problem for his college juniors. Can you solve it?

Given N rooms, where each room has a one-way door to a room denoted by $r[i]$, where $1 \leq i \leq N$. Find a positive integer K such that, if a person starts from room i, $(1<=i<=N)$, and continuously moves to the room it is connected to (i.e. $room[i]$) , the person should end up in room i after K steps;

Note: The condition should hold for each room.If there are multiple possible values of K modulo (109+7), find the smallest one.If there is no valid value of K, output −1

Week 10: Implement the following using python

a) M-coloring
b) Vertex coloring
c) Edge coloring

Week 11: Implement the following graph traversal methods.

a) Depth-First Search
b) Breadth-First Search
c) You are presented with a network comprising N computers and M wired connections between them. Your objective is to optimize the network's connectivity using precisely K wires from your inventory. The aim is to **maximize** the number of computers that can be linked together within the given constraints. Your task is to determine and report the size of the largest network that can be formed by establishing these connections.

In the context of this problem, computers are considered connected if they share either a direct or indirect wired connection. It is worth noting that the value of K will always be less than the number of isolated (standalone) networks in the given configuration, and it may even be zero.

d) A country consists of N cities. These cities are connected with each other using $N-1$ bidirectional roads that are in the form of a tree. Each city is numbered from 1 to N. You want to safeguard all the roads in the country from any danger, and therefore, you decide to place cameras in certain cities. A camera in a city cansafeguard all the roads directly connected to it. Your task is to determine the minimum number of cameras that are required to safeguard the entire country.

Week 12: Travelling Salesman problem**.**

a) You are working in a salesmen company as a programmer.

There are *n* towns in your country and *m* directed roads between them. Each road has a cost person should spend on fuel. The company wants to sell goods in all *n* towns. There are infinitely many salesmen in the company. We can choose some positive number of salesmen and give a non-empty list of towns to each of them. Towns from the list are the towns to sell goods in. Each salesman will visit all the towns in his list in this particular order in cycle (after the last town he will return to the first town and so on). Salesman can visit other towns on his way but he will not sell goods in these towns. Two salesmen cannot sell goods in one town because it will attract unnecessary attention to your company. But for every town there must be a salesman who sell goods in this town. If salesman's list of towns consists of exactly one town then he should pay fee to stay in this town each month (each town has its own fee) or he should go for a round trip and spend money on fuel.

Your task is to calculate the minimal amount of money company must spend monthly to achieve its goals. We will assume that every salesman will spend a month to make one cycle.

b) It is the final leg of the most famous amazing race. The top 'n' competitors have made itto the final. The final race has just begun. The race has 'm' checkpoints. Each team can reach any of the 'm' checkpoint but after a team reaches a particular checkpointthat checkpoint gets closed and is not open to any other team. The race ends when 'k' teams finish the race. Each team travel at a constant speed throughout the race which might be different for different teams. Given the coordinates of n teams and m checkpoints and speed of individual team return the value of minimum time needed to end the race.

c) Little Jhool is a very lenient teaching assistant in his college. He doesn't like cutting the marks of students, so obviously, every student in his tutorial loves him. But anyway, the teacher has got to know about the leniency of Jhool while giving marks, so this time in exam, he decides to give a different exam paper to every single student to check how well have the students been taught by Jhool. Now, Little Jhool knows the strong and weak topics of every single student, so he wants to maximize the total marks obtained by students in his tutorial.You are given the number of students in Jhool's tutorial, denoted by **n - n** also being the number of different exam papers - that is, one for every student. Every student will get only one exam paper to solve. You are further given a matrix, *(n x n)* denoting the marks every student will get if he attempts a particular exam paper. You've to help Jhool figure out a way by which he could maximize the total score obtained by his entire class.

Week 13: Construct minimal spanning tree using the following

a) Prim's Algorithm
b) Kruskal's Algorithm
c) There are total *N* Hacker-cities in a plane. Each city is located on coordinates ([i],[i]) and there can be any number of cities on the same coordinates.

You have to make these cities connected by constructing some roads in such a waythat it is possible to travel between every pair of cities by traversing the roads. The

cost of constructing one road between any two cities is the minimum of the absolute difference between their X and Y coordinates.

As you want to earn more and more, you decided to do this in the most optimal way possible, such that the total cost of constructing these roads is minimal. You have to return the minimum money you need to spend on connecting all the cities.

d) Tom is visiting the country Hackerland. Hackerland has n cities and m bi-directional roads. There are k types of tokens. Token i costs ci. The costs of the tokens are such that for all $2 \leq i \leq k$, $ci \geq 2ci-1$. For each road, you need to have a particular set oftokens, if you want to travel it. Note that you don't have to give the tokens, you just need to show them. Thus, one token can be used at any number of roads, where it is required. Tom wants to select a set of tokens, such that using them, he can go from any city to any other city. You have to help him minimize the total cost of tokens he buys.

TEXT BOOKS:

1. Core Python Programming, Wesley J. Chun, Third Edition, Pearson.
2. Karin R Saoub, Graph Theory: An Introduction to Proofs, Algorithms, and Applications, 1 st edition, Chapman and Hall, 2021.

REFERENCE BOOKS:

1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, VamsiKurama, Pearson
4. Learning Python, Mark Lutz, O'Really.

24X0027: PUBLICSPEAKING SKILLS

B.Tech.I Year. II Sem. L T P C

2 0 0 0

Course Overview:

This course is designed to develop students' public speaking skills, focusing on speech preparation, delivery techniques, and the use of non-verbal communication. Students will learn to present effectively in various contexts, from formal presentations to informal meetings.

Prerequisites: Basic communication skills

Course Objectives: The students will learn:

- Understand the fundamentals and prerequisites of public speaking.
- Develop the ability to convert ideas into structured speeches.
- Enhance performance through verbal and non-verbal communication.
- Master different types of public speaking and professional presentations.
- Learn the etiquette and manner isms required for effective public speaking.

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

1. **Prepareanddeliver**speechesconfidentlybyorganizingcontentandovercomingstagefright.
2. **Utilize** verbal and non-verbal communication to engage the audience effectively.
3. **Adapt** to different contexts by tailoring speeches for diverse audiences and settings.
4. **Exhibit**professionalismandcreativityusingproperetiquette,rhetoricaldevices,andcreative language

Module1: Fundament also f Public Speaking

This unit introduces public speaking, covering its importance, course structure, assessment methods, and prerequisites like understanding the audience, research, organizing speech structure, over coming Stage fright, and practicing speech delivery.

Module2:SpeechDevelopmentandDelivery

This unit focuses on converting ideas into action through brainstorming, outlining, drafting speeches, using storytelling, and practicing impromptu speaking. It also emphasizes public speaking as a performative act, covering voice modulation, eye contact, audience engagement, effective pacing, gestures, and techniques for handling questions and interruptions.

Module3: Non-verbal Communication and Speech Types

This unit explores non-verbal communication's role in public speaking, covering the importance and types of cues like facial expressions and gestures, aligning verbal with non-verbal messages, observing audience feedback, and adapting non-verbal communication to virtual settings. It also addresses various types of public speaking, including informative, persuasive, special occasion, motivational speeches, panel discussions, and debates.

Module4: Professional and Formal Speaking

This unit covers speeches, including analysis of famous examples, preparing and delivering various types, conducting peer and self-evaluation, and effectively utilizing visual aids and multimedia. Adapting speeches for diverse audiences, and addressing practical skills for interviews, professional communication,conductingmeetings,conferences,presentations,andbuildingprofessionalnetworks.

Module5:Advanced Techniques and Professionalism

This unit focuses on structuring and delivering professional presentations effectively, using creative language techniques for impactful messaging, and embodying proper etiquette and professionalism in public speaking.

TEXTBOOK:

- "**The Art of Public Speaking**" by Dale Carnegie Prabhat Prakashan Pvt. Ltd.; First Edition (31 December 2020) **ISBN-10:**8184302614

REFERENCEBOOKS:

- **"The Art of Public Speaking" by Stephen E. Lucas**, ISBN: 978-0073523910, Year of Publication: 2014, Publisher: McGraw-Hill Education
- **Confessions of a Public Speaker" by Scott Berkun**, ISBN: 978-0596801991, Year of Publication: 2010, Publisher: O'Reilly Media ISBN: 978-0596801991, Year of Publication: 2010
- **"Speak Like Churchill, Stand Like Lincoln: 21 Powerful Secrets of History's Greatest Speakers" by James C. Humes,** ISBN: 978-0761563518, Year of Publication: 2002, Publisher: Three Rivers Press
- **"The Quick and Easy Way to Effective Speaking" by Dale Carnegie,** ISBN: 978-0671724009, Year of Publication: 1990, Publisher: Pocket Books

II-I

2430121 - SURVEYING

B. Tech. II Year I Sem

L	T	P	C
2	0	0	2

Prerequisites: Matrix Algebra and Calculus

I. COURSE OVERVIEW

Surveying deals preparation of plan and maps. Surveying is the technique, profession, science and art of making all essential measurements to determine the relative position of points or physical and cultural details above, on, or beneath the surface of the Earth, and to depict them in their objectives. Surveyors use elements of mathematics (geometry and trigonometry), physics, engineering and law. Surveyor measures certain dimensions that generally occur on the surface of the Earth. Surveying equipment, such as levels and the thodolites, are used for accurate measurement of angular deviation, horizontal, usable form, or to establish the position of points or details. These points are usually on the surface of the earth, and they are often used to establish land maps and boundaries for ownership or governmental purposes. To accomplish vertical and slope distances with computerization, electronic distance measurement (EDM), total stations, remotes sensing, Photogrammetric, GPS surveying and laser scanning have supplemented to a large extent.

II. COURSE OBJECTIVES

The objectives of the course are

1. To know the principles and methods of surveying
2. To measure horizontal and vertical- distances and angles
3. To recording of observation accurately and Perform calculations based on the observation
4. To Identify source of errors and rectification methods
5. To apply surveying principles to determine areas and volumes and setting out curves

III. COURSE OUTCOMES

At the end of the course the student will able to

1. Understand principles of surveying and Apply chain and compass surveying.
2. Understand working principles of leveling and contouring, determination of levels.
3. Understand and apply Theodolite surveying and tacheometric surveying.
4. Apply the method of traversing and gaining knowledge on curve alignment by different methods
5. Understand & apply the principles and concepts of modern equipment and its methodologies

IV. SYLLABUS

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Different methods of distance measurement, direct methods of distance measurement using chain/tape, ranging, Tape corrections.

Compass and its types, Bearings, Included angles, Local Attraction, Magnetic Declination and dip

UNIT - II

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.

Contouring- Characteristics and uses of Contours, methods of contour surveying.

Areas and volumes - Determination of areas for regular and irregular boundary, Determination of volume of earth work for level section, volume of borrow pits, capacity of reservoirs.

UNIT - III

Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

Tacheometric Surveying: Principles of Tacheometry, stadia and tangential methods of Tacheometry

UNIT - IV

Traversing: Methods of Traversing, traverse computations and adjustments, Omitted measurements.

Curves: Types of curves and their necessity, elements of simple, compound, reverse, transition and vertical curves.

UNIT - V

Modern Surveying Methods: Total Station and Global Positioning System: Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory - electromagnetic distance measuring system - principle of working and EDM instruments, Components of GPS – space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

V. TEXT BOOKS

1. Surveying (Vol – 1, 2 & 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications (P) ltd., New Delhi.2005.
2. Duggal S K, "Surveying (Vol – 1 & 2)", Tata McGraw Hill Publishing Co. Ltd. New Delhi.2013.
3. N N Basak, "Surveying and Levelling", Tata McGraw Hill Publishing Co. Ltd. New Delhi.2017.
4. Chandra A M, "Plane Surveying and Higher Surveying", New age International Pvt. Ltd., Publishers, New Delhi.2006.

VI. REFERENCES

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, Tata McGraw Hill Publishing Co. Ltd. New Delhi.1991.
2. Arora K R "Surveying (Vol 1, 2 & 3), Standard Book House, Delhi.2008.
3. R. Subramanian, "Surveying and Levelling", Oxford University Press, New Delhi.2019.

VII. WEB REFERENCES

1. https://nptel.ac.in/courses/105104100/43
2. https://www.coloradomesa.edu/wccc/programs/land-surveying-geomatics.html
3. https://books.google.co.in/books?id=FaCgAAQBAJ&printsec=frontcover&dq=surveying+and+geomatics+ONLINE

2430122 - STRENGTH OF MATERIALS – I

B. Tech. II Year I Sem

L	T	P	C
3	0	0	3

Pre-requisites: Engineering Mechanics

I. COURSE OVERVIEW:

Strength of Materials, deals with deformable solids, requires basic knowledge of principles of mechanics from Engineering Mechanics course and acts as a pre-requisite to the advanced courses on Structural Analysis and Design. This course introduces study of simple stresses, strains and principal stresses on deformable solids. This course imparts knowledge on shear force and bending moment, bending stresses, shear stresses, deflection of beams. It focuses on the analysis of members subjected to axial, bending, and torsional loads. In a nutshell, the course aims at developing the skill to solve engineering problems on strength of materials. Eventually, through this course content, engineers can analyze the response of various structural members under different loading conditions and design the same, satisfying the safety and serviceability conditions.

II. COURSE OBJECTIVES:

The objectives of the course are

1. To understand the concepts of stress, strain and strain energy
2. To calculate the shear force and bending moments for various loading conditions
3. To analyze the beams under flexural stresses and shear stresses.
4. To calculate the deflections of beams under different loading conditions
5. To understand principal stresses and strains in structural members and various theories of failures.

III. COURSE OUTCOMES:

At the end of the course the student will able to

1. Evaluate the strength and deformation of members subjected to axial load.
2. Analyse the shear force and bending moment diagrams for determinate beams subjected to various loads.
3. Analyse the bending stresses and shear stresses in various beam sections
4. Analyse the slope and deflection of beams by various methods
5. Evaluate the stresses on oblique plane and understand the concepts of various theories of failures.

IV. SYLLABUS:

UNIT - I

Simple stresses and strains: Concept of stress and strain – Types of stresses and strains – stress-Strain diagram for mild steel rods - Elasticity and plasticity – Hooke's law – Elastic constants – Relation between Elastic constants - Poisson's ratio – Bars of varying section – composite bars – Temperature stresses.

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

UNIT - II

Shear force and bending moment: Beam - Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for determinate beams – Point of contraflexure – Relations between Load, S.F. and B.M.

UNIT - III

Flexural stresses: Pure bending - Theory of simple bending – Assumptions Expression for bending stress - Neutral Axis and Moment of Resistance –- bending stresses in symmetrical sections and unsymmetrical sections - Section Modulus

Shear stresses: Expression for Shear stress at a section – Shear stress distribution for different sections.

UNIT - IV

Deflection of beams: Slope and deflection– Double integration method - Macaulay's method – Moment area method - Conjugate beam method

UNIT - V

Principal stresses and Strains: Methods of Determining Stresses on oblique section – Analytical and graphical solutions – Strain on an Oblique plane.

Theories of failure: Introduction – Various theories of failure

V. TEXT BOOKS:

1. Strength of Materials by R. K Rajput, S. Chand & Company Ltd.2022.
2. Mechanics of Materials by Dr. B.C Punmia, Dr. Ashok Kumar Jain and Dr. Arun Kumar Jain, Laxmi Publications Pvt Limited.2017.
3. Strength of Materials by R. Subramanian, Oxford University Press.2010.
4. Strength of Materials by S. Ramamrutham, Dhanpat Rai Publishing Company (p) Ltd.1970
5. Strength of Materials by R.S.Khurmi, S.Chand and Co. 2006

VI. REFERENCES:

1. Mechanics of Materials by R.C. Hibbeler, Prentice Hall publications.2010.
2. Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall publications.1998.
3. Strength of Materials by T.D.Gunneswara Rao and M.Andal, Cambridge University Press.2018.
4. Strength of Materials by R.K. Bansal, Lakshmi Publications Pvt. Ltd.2009.
5. Strength of Materials by B.S.Basavarajaiah and P. Mahadevappa, Universities Press.2010.

VII. WEB REFERENCES:

1. http://www.nptelvideos.in/2012/11/strength-of-materials-%20prof.html
2. http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-050-solid-mechanics-fall-%20%20%202004/lecturenotes/
3. http://www.youtube.com/watch?v=coRgpxG2pyY&list=PLLbvVfERDon3oDfCYxkwRct1Q6YeOzi9g

2430123 – FLUID MECHANICS

B. Tech. II Year I Sem **L T P C**

2 0 0 2

Pre-requisites: Nil

I. COURSE OVERVIEW:

This course provides students with an introduction to principal concepts and methods of fluid mechanics. Topics covered in the course include pressure, hydrostatics, and buoyancy; open systems and control volume analysis; mass conservation and momentum conservation for moving fluids; viscous fluid flows, flow through pipes; dimensional analysis; boundary layers, and lift and drag on objects. Students will work to formulate the models necessary to study, analyze, and design fluid systems through the application of these concepts, and to develop the problem solving skills essential to good engineering practice of fluid mechanics in practical applications.

II. COURSE OBJECTIVES:

The objective of the course is

1. To introduce the concepts of fluid mechanics useful in Civil Engineering applications
2. To provide a first level exposure to the students to fluid statics, kinematics and dynamics.
3. To learn about the application of mass, energy and momentum conservation laws for fluid flows
4. To train and analyse engineering problems involving fluids with a mechanistic perspective is essential for the civil engineering students
5. To prepare a student to build a good fundamental background useful in the application intensive courses covering hydraulics, hydraulic machinery and hydrology

III. COURSE OUTCOMES:

At the end of the course the student will able to

1. Understand the basic terms used in fluid mechanics and principles of fluid statics.
2. Understand the broad principles of fluid kinematics and dynamics
3. Apply the bernoulis principle in different flow measurements such as venturimeter, orifice meter, notches and weirs
4. Evaluate the minor and major losses through pipes and analyse the pipe networks using different methods
5. Apply the continuity, momentum and energy principles in boundary layer concepts.

IV. SYLLABUS:

UNIT - I

Properties of Fluid

Basic concepts: Density, Specific weight, Specific volume, Specific gravity, Kinematic and dynamic viscosity - variation of viscosity with temperature - Newton law of viscosity - vapour pressure - boiling point - surface tension and capillarity

Fluid Statics

Fluid Pressure at a point, variation of pressure in a fluid, Pascal's law, measurement of pressure - simple and differential manometers - Hydrostatic pressure and force: horizontal, vertical and inclined surfaces - Buoyancy

UNIT - II

Fluid Kinematics

Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two- and three-dimensional flows - Stream line - path line - streak line and stream tube - stream function, velocity potential function - One, two- and three-dimensional continuity equations in Cartesian coordinates.

Fluid Dynamics

Euler's and Bernoulli's equation - Impulse-momentum equation and its applications – Bernoulli's equation to real fluid flows.

UNIT - III

Flow Measurement

Practical applications of Bernoulli's equation: venturimeter, orifice meter and pitot tube - Momentum principle - Forces exerted by fluid flow on pipe bend

Flow Over Notches & Weirs

Flow through rectangular; triangular and trapezoidal notches and weirs - Velocity of approach - Broad crested weir.

UNIT - IV

Flow through Pipes

Reynolds experiment - Loss of head through pipes – Darcy-Weisbach equation – hagen Poiseuille equation - minor losses - total energy line - hydraulic grade line - pipes in series - equivalent pipes - pipes in parallel – syphon - power transmission through pipes - water hammer in pipes and control measures.

UNIT - V

Boundary Layer Concepts

Boundary layer: Definition, laminar and turbulent boundary layers - boundary layer thickness - displacement thickness - momentum thickness and energy thickness - Laminar sub-layer, smooth and rough boundaries - Boundary layer separation and Control - Definition of Drag and Lift and types drag - magnus effect.

V. TEXT BOOKS:

1. Fluid Mechanics by Modi and Seth, Standard Book House.2019.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015.
3. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt. Ltd.2022.

VI. REFERENCES:

1. Theory and Applications of Fluid Mechanics by K. Subramanya, Tata McGraw Hill.1993.
2. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Private Limited.2017.
3. Fluid Mechanics and Machinery by C.S.P. Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
4. Fluid mechanics & Hydraulic Machines by Domkundwar & DomkundwarDhanpat Rai & Co. 2014.
5. Fluid Mechanics and Hydraulic Machines by R. K. Bansal, Laxmi Publication Pvt Ltd.2010.

VII. WEB REFERENCE:

1. http://nptel.ac.in/courses/112105171/1
2. http://nptel.ac.in/courses/105101082/
3. http://nptel.ac.in/courses/112104118/ui/TOC.htm

COURSE CONTENT

PROBABILITY AND STATISTICS								
III Semester: CIVIL								
Course Code	**Category**	**Hours/ Week**			**Credits**	**Maximum Marks**		
2430006	**Basic Science**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	1	0	4	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes:48**		
Prerequisites: Mathematics courses of first year of study.								

Course Overview:

This Course deals with basic probability theory & statistical techniques. Each method will be explained in theoretical with real life examples. Problem solving techniques will be taught with respect to the theory. Interpretation for these problems will be highlighted. More number of Exercise problems will be given for enhancing their problem-solving skills. The students will improve their ability to think critically, to analyse a real problem and solve it using a wide array of mathematical tools.

Course Objectives:

1. The Concept of Random variables.
2. Probability distributions of single random variables.
3. The sampling theory and the concept of Estimation.
4. Testing of hypothesis and making statistical inferences.
5. The basic idea of Curve fitting, correlation and regression.

Course Outcomes: After Completion of the Course, Students should be able to

1. Formulate and solve real world problems involving Random variables.
2. Identify probability distributions to various case studies.
3. Understand the concept of sampling and apply concept of Estimation.
4. Apply the concept of testing a hypothesis to case studies.
5. Correlate the concepts of one unit to the concepts in other units.

UNIT-I: Probability and Random Variables

Probability of an Event, Additive Rules, Conditional Probability, Product Rule and the Baye's Rule (All rule without proof). Random variables: Discrete and continuous random variables and their properties, Expectation of Random Variables, Variance of random variables.

UNIT-II: Probability Distributions

Discrete Probability distributions: Binomial and Poisson distributions, statistical parameters for these distributions (without proof).

Continuous probability distributions: Normal and Uniform distributions, statistical parameters for these distributions (without proof).

UNIT-III: Sampling Distribution & Estimation

Sampling Distributions: Random Sampling, Parameters and Statistics, Sampling Distribution of Means and the Central Limit Theorem, t - Distribution, F-Distribution.

Estimation: Estimating the Mean, Standard Error of a Point Estimate, Confidence Intervals for single

sample and two Samples.

UNIT-IV: Test of Hypothesis

Hypothesis: General Concepts, Testing a Statistical Hypothesis, Tests Concerning Large samples - Single Mean, Two Means, Single Proportion and two Proportions. Small samples- T-test for Single Mean and Two Means.

UNIT - V: Applied Statistics

Curve fitting by the method of least squares, fitting of straight lines, second degree parabolas and more general curves, Correlation and regression (Linear), Rank correlation (Repeated and Non-Repeated).

TEXTBOOKS:

1. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye, Probability & Statistics For Engineers & Scientists,9th Ed. Pearson Publishers.
2. S C Gupta and V K Kapoor, Fundamentals of Mathematical statistics, Khanna publications.

REFERENCEBOOKS:

1. T.T. Soong, Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons, Ltd, 2004.
2. Sheldon M Ross, Probability and Statistics for Engineers and scientists, academic press.

ELECTRONIC RESOURCES:

https://www.youtube.com/watch?v=j9WZyLZCBzs
https://www.youtube.com/watch?v=UnzbuqgU2LE
https://www.youtube.com/watch?v=gI5y3RZe9fk
https://www.youtube.com/watch?v=l87zHfGW3Z4
https://www.youtube.com/watch?v=kjfIPyrdzuE
https://www.youtube.com/watch?v=IkbkEtOOC1Y

MATERIALS ONLINE:

1. Course template
2. Tutorial question bank
3. Definitions and terminology
4. Assignments
5. Model question paper–I
6. Model question paper–II
7. Lecture notes
8. E-Learning Readiness Videos(ELRV)

2430507: DATA STRUCTURES
(COMMON TO ALL BRANCHES)

B.Tech. II Year I Sem.	L	T	P	C
	3	0	0	3

Course Overview:

Data structures are the fundamental building blocks of computer programming. They define how data is organized, stored, and manipulated within a program. Understanding data structures is very important for developing efficient and effective algorithms. In this Course, student will explore the most commonly used data structures, including **linked lists, stacks, queues, trees, and Hashing.**

Prerequisites:

- A course on "Essentials of Problem Solving using python".

Course Objectives: The students will try to learn

- Various linear and non-linear data structures.
- How to perform operations on data structures.
- Priority Queues and Heaps
- Various searching and sorting techniques.
- Different hashing techniques

Course Outcomes: After successful completion of the course, students should be able to

- Develop solutions by using different types of linked lists
- Solve problems using stack and queue
- Learn different types of trees and their applications
- Implement and know the application of algorithms for searching and sorting.
- Design Programs using Hashing

Module -I: Linked Lists **[9]**

Introduction to Data Structures, Linear list — singly linked list, Doubly linked list, Circular linked list - operations and its applications.

Module-II: Stack and Queue **[8]**

Stacks- Introduction, Operations, array and linked representations of stacks, stack applications (Infix to postfix conversion and postfix evaluation),

Queues- Introduction, operations, array and linked representations of queues and its applications.

Module-III: Trees **[10]**

Trees: General Trees, Binary Trees, Implementing Trees, Tree traversals

Search Trees: Binary Search Trees,Balanced search trees- AVL trees, B- trees

Priority Queue and Heaps: Priority queue ADT, Priority queue, Applications, Heap Trees, implementing a priority queue with a Heap, Heap Sort.

Module–IV: Searching and Sorting **[9]**

Searching: Linear Search and Binary Search and its applications.

Sorting: Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort and its applications.

Module – V: Hashing **[8]**

Introduction, Hash Functions-Modulo, Middle of Square, Folding, Collision Resolution Techniques-Separate Chaining, Open addressing,- Linear Probing, Quadratic Probing, Double Hashing.

TEXTBOOKS:

1. Fundamentals of data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2nd Edition, Universities Press.
2. Data structures using C, A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

REFERENCES:

1. Data structures: A Pseudocode Approach with C, R.F.Gilberg And B.A.Forouzan, 2nd Edition, Cengage Learning.
2. Introduction to data structures in C, Ashok Kamthane, 1st Edition, PEARSON.

2430177 - SURVEYING LABORATORY

B. Tech. II Year I Sem **L T P C**

0 0 2 1

Pre-requisites: Surveying

I. COURSE OVERVIEW:

The Surveying Laboratory is equipped with the instruments and tools that students use throughout the surveying course. Students learn techniques for gathering field data with both traditional and modern instruments. A set of instruments are used such as surveying chains, tapes, auto level, dumpy levels, theodolite, ranging rods, tripods, pegs, plane tables and other common surveying tools and ancillary equipment's.

II. COURSE OBJECTIVES:

The objective of the course is

1. To know the principles and methods of surveying using different equipments& methods
2. To determination of distance, area using chain, compass and plane table surveying
3. To Recording the observation accurately and Perform calculations based on the observation
4. To Identify of source of errors and rectification methods
5. To understand the concept of advanced techniques and operation of modern equipment and perform various experiments by using that.

III. COURSE OUTCOMES:

At the end of the course the student will able to

1. Measure the distance, area of the field using the instruments chain, compass, plane table and plot the same.
2. Understand concepts of leveling, and perform & plot the cross & longitudinal sectioning.
3. Measurement of angles using theodolite, and calculate the distance and elevation of the given point using trigonometric leveling and tacheometric leveling.
4. Understand the concepts of EDM, and calculate the distance, area of the field and perform the traverse and plot the contour map for the obtained data.
5. Locate the position of points using stake out method, Surveying using modern equipment.

IV. SYLLABUS:

List of Experiments:

1. Surveying of an area by chain and compass survey (closed traverse) & plotting
2. Determine of distance between two inaccessible points with compass
3. Radiation method, intersection methods by plane table survey.
4. Leveling – Longitudinal and cross-section and plotting
5. Measurement of Horizontal and vertical angle by Theodolite
6. Trigonometric leveling using Theodolite
7. Height and distances using principles of tachometric surveying
8. Determination of height, remote elevation, distance between inaccessible points using total station
9. Determination of Area using total station and drawing map
10. Traversing using total station for drawing contour map
11. Stake out using total station
12. Setting out Curve using total station.

V. REFERENCES:

1. H. S. Moondra, Rajiv Gupta, "Laboratory Manual for Civil Engineering", CBS Publishers Pvt .Ltd., New Delhi, 2ndEdition, 2013.
2. James M. Anderson, Edward M. Mikhail, "Surveying: Theory and Practice", Tata McGraw Hill Education, 2012.
3. S. S. Bhavikatti, "Surveying Theory and Practice", IK Books, New Delhi, 2010.

2430178 - STRENGTH OF MATERIALS LABORATORY

B. Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Pre-requisites: Strength of Materials - I

I. COURSE OVERVIEW:

This course offers a comprehensive exploration of material behavior through laboratory experiments. Students delve into the fundamental principles acquired in the classroom, gaining hands-on experience with a wide range of equipment. The course covers various testing methodologies, including tensile and compression testing to determine material strengths, flexural testing for bending behavior, and torsional testing for shear properties. Impact tests assess material toughness, while experiments on deflection and fatigue provide insights into structural performance.

II. COURSE OBJECTIVES:

The objective of the course is

1. To make measurements of different strains, stress and elastic properties of materials used in Civil Engineering.
2. To provide physical observations to complement concepts learnt
3. To introduce experimental procedures and common measurement instruments, equipment, devices.
4. To exposure to a variety of established material testing procedures and techniques
5. To different methods of evaluation and inferences drawn from observations

III. COURSE OUTCOMES:

At the end of the course the student will able to

1. Analyse properties of steel, brick and concrete
2. Analyse deflection, bending strength and young's modulus of cantilever and simply supported beam.
3. Evaluate modulus of rigidity of different materials
4. Evaluate hardness value of different material
5. Evaluate impact, shear strength, stiffness and modulus of elasticity of material

IV. SYLLABUS:

List of Experiments:

1. Tension test
2. Bending test on (Steel / Wood) cantilever beam.
3. Bending test on simply support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on concrete or bricks
8. Impact test
9. Shear test
10. Verification of Maxwell's reciprocal theorem on beams.

V. REFERENCES:

1. Strength of Materials by R. K Rajput, S. Chand & Company Ltd. 2022
2. Strength of Materials by R.K. Bansal, Lakshmi Publications Pvt. Ltd. 2019

2430575: DATA STRUCTURES LAB USING PYTHON

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Course Overview:

Data structures are the fundamental building blocks of computer programming. They define how data is organized, stored, and manipulated within a program. Understanding data structures is very important for developing efficient and effective algorithms. In this Course, student will explore the most commonly used data structures, including linked **lists, stacks, queues, trees, and Hashing.**

Prerequisites:

- A course on "Essentials of Problem Solving".

Course Objectives: The students will try to learn

- Various linear and non-linear data structures.
- How to perform operations on data structures.
- Priority Queues and Heaps
- Various searching and sorting techniques.
- Different hashing techniques

Course Outcomes: After successful completion of the course, students should be able to

- Develop solutions by using different types of linked lists
- Solve problems using stack and queue
- Learn different types of trees and their applications
- Implement and know the application of algorithms for searching and sorting.
- Design Programs using Hashing

List of Experiments

1. Write a program that uses functions to perform the following operations on singly linked list.:
   i) Creation ii) Insertion iii) Deletion iv) Traversal
2. Write a program that uses functions to perform the following operations on doubly linked list.:
   i) Creation ii) Insertion iii) Deletion
3. Write a program that uses functions to perform the following operations on circular linked list: i) Creation ii) Insertion iii) Deletion
4. Write a program that implement stack operations using i) Arrays ii) Pointers
5. Write a c program to implement infix to postfix conversion using stack.
6. Write a c program to implement postfix evaluation.

7. Write a program that implement Queue operations using i) Arrays ii) Pointers
8. Write a program to implement the tree traversal methods using both recursive and non- recursive.
9. Write a program to implement tree operations on i) AVL Trees ii) B Trees iii) Heap
10. Write a program that implements the following sorting methods to sort a given list of integers in ascending order i) Bubble sort ii) Selection sort iii) Insertion sort
11. Write a program that implements the following sorting methods to sort a given list of integers in ascending order i) Merge sort ii) Quick sort iii) Heap Sort
12. Write a program that use both recursive and non-recursive functions to perform the following searching operations for a Key value in a given list of integers: i) Linear search ii) Binary search
13. Write a program to implement hashing.

CASE STUDY-1 Balanced Brackets

A bracket is considered to be any one of the following characters: (,), {, }, [, or].

Two brackets are considered to be a *matched pair* if the an opening bracket (i.e., (, [, or {) occurs to the left of a closing bracket (i.e.,),], or }) *of the exact same type*. There are three types of matched pairs of brackets: [], {}, and ().

A matching pair of brackets is *not balanced* if the set of brackets it encloses are not matched. For example, {[(])} is not balanced because the contents in between { and } are not balanced. The pair of square brackets encloses a single, unbalanced opening bracket, (, and the pair of parentheses encloses a single, unbalanced closing square bracket,].

By this logic, we say a sequence of brackets is *balanced* if the following conditions are met:

- It contains no unmatched brackets.
- The subset of brackets enclosed within the confines of a matched pair of brackets is also a matched pair of brackets.

Given strings of brackets, determine whether each sequence of brackets is balanced. If a string is balanced, return YES. Otherwise, return NO.

CASE STUDY-2 Minimum Average Waiting Time

Mr. Raju owns a pizza restaurant and he manages it in his own way. While in a normal restaurant, a customer is served by following the first-come, first-served rule, Raju simply minimizes the average waiting time of his customers. So he gets to decide who is served first, regardless of how sooner or later a person comes.

Different kinds of pizzas take different amounts of time to cook. Also, once he starts cooking a pizza, he cannot cook another pizza until the first pizza is completely cooked. Let's say we have three

customers who come at time t=0, t=1, & t=2 respectively, and the time needed to cook their pizzas is 3, 9, & 6 respectively. If Raju applies first- come, first-served rule, then the waiting time of three customers is 3, 11, & 16 respectively. The average waiting time in this case is (3 + 11 + 16) / 3 = 10. This is not an optimized solution. After serving the first customer at time t=3, Raju can choose to serve the third customer. In that case, the waiting time will be 3, 7, & 17 respectively. Hence the average waiting time is (3 + 7 + 17) / 3 = 9.
Help Raju achieve the minimum average waiting time. For the sake of simplicity, just find the integer part of the minimum average waiting time.

Note:

- The waiting time is calculated as the difference between the time a customer orders pizza (the time at which they enter the shop) and the time she is served.
- Cook does not know about the future orders.

TEXTBOOKS:

1. Fundamentals of data structures in C, E.Horowitz, S.Sahni and Susan Anderson Freed, 2nd Edition, Universities Press.
2. Data structures using C, A.S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/pearson education.

REFERENCES:

1. Data structures: A Pseudocode Approach with C, R.F.Gilberg And B.A.Forouzan, 2nd Edition, Cengage Learning.
2. Introduction to data structures in C, Ashok Kamthane, 1st Edition, PEARSON

2430196 – STRUCTURAL MODELING LABORATORY

B. Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Pre-requisites: Computer Aided Engineering graphics

I. COURSE OVERVIEW:

This course provides a comprehensive understanding of Structural modelling using SketchUp, focusing on 3D modeling for civil engineering, architecture, and construction planning. It covers basic tools, advanced techniques, and real-world applications in structural and site design.

II. COURSE OBJECTIVES:

The objective of the course is to

1. Understand application of sketch up in Civil Engineering Structures.
2. Understand the different tools used in sketchup.
3. Modeling of different structural components.
4. Learn editing tools and rendering.
5. Draw detailed drawings of different features in structures.

III. COURSE OUTCOMES:

At the end of the course the student will able to

1. Understand how to use Sketchup software for Interior design.
2. Create 2D and 3D Geometry
3. Apply Modeling of beams, columns, slabs, and walls
4. Apply editing materials and rendering
5. Create detailed drawing in layout

IV. SYLLABUS:

List of Experiments:

1. Introduction to SketchUp

- Overview of SketchUp and its applications in Civil Engineering
- Installing SketchUp and understanding the interface
- Navigating the workspace (toolbars, panels, and view settings)
- Basic drawing and editing tools

2. Creating 2D & 3D Geometry

- Drawing basic 2D shapes (lines, rectangles, circles, arcs, polygons)
- Understanding inference and snapping tools
- Extrusion using the Push/Pull tool
- Creating 3D objects and modifying geometry

3. Structural Modeling

- Modeling beams, columns, slabs, and walls

4. Materials & Rendering

- Applying and editing materials
- Using textures and creating custom materials
- Introduction to rendering plugins (V-Ray, Enscape, Lumion)

5. Presentation & Documentation

- Creating detailed drawings in Layout
- Dimensioning and annotation techniques
- Generating reports and cost estimation using SketchUp tools

Case Studies & Project Work

- Real-world civil engineering applications of SketchUp
- Developing a complete project (residential, commercial, or infrastructure)
- Final project presentation and evaluation

V. REFERENCES:

1. "SketchUp for Site Design: A Guide to Modeling Site Plans, Terrain, and Architecture" – Daniel Tal
2. "The SketchUp Workflow for Architecture" – Michael Brightman
3. "SketchUp for Builders: A Comprehensive Guide for Creating 3D Building Models" – John G. Brock

II-II

2440124 - STRENGTH OF MATERIALS - II

B. Tech. II Year II Sem

L	T	P	C
3	0	0	3

Pre-requisites: Strength of Materials – I

I. COURSE OVERVIEW:

Strength of Materials, deals with deformable solids, requires basic knowledge of principles of mechanics from Engineering Mechanics course and acts as a pre-requisite to the advanced courses on Structural Analysis and Design. This course introduces study of circular shaft, springs, columns, and stresses on retaining wall, chimneys, thick cylinder and thin cylinder. It focuses on the analysis of members subjected to axial, bending, and torsional loads. It also focuses stresses on symmetrical and unsymmetrical section. In a nutshell, the course aims at developing the skill to solve engineering problems on strength of materials. Eventually, through this course content, engineers can analyze the response of various structural members under different loading conditions and design the same, satisfying the safety and serviceability conditions.

II. COURSE OBJECTIVES:

The objective of the course is

1. To understand the concepts of torsion and deflection of springs
2. To understand the behavior of columns and struts for various loading conditions
3. To calculate the direct and bending stresses of members subjected to various loads
4. To analyze the members for stability under sliding and overturning
5. To evaluate the hoop and radial stresses for thick and thin cylinders
6. To evaluate the stresses due to unsymmetrical bending and location of shear center

III. COURSE OUTCOMES:

At the end of the course the student will able to

1. Apply the torsion theory for analysis of circular shafts and springs
2. Analyze columns and struts
3. Evaluate stresses in case of retaining walls, chimneys and dams and Analyze the structures under the conditions of sliding and overturning
4. Analyze the stress in Thin and thick cylinders.
5. Understand the concept of stresses & shear center for symmetrical and unsymmetrical Sections

IV. SYLLABUS:

UNIT - I

Torsion of circular shafts: Theory of pure torsion – Derivation of Torsion equation – Maximum torque transmitted by a circular solid shaft – Hollow circular shaft – Power transmitted by shafts - Polar section modulus – Combined bending and torsion – Design of shafts.

Springs: Types of springs – deflection of close and open coil helical springs under axial pull and axial couple – springs in series and parallel.

UNIT – II

Columns and struts: Introduction – Failure of a column Assumptions End conditions for long column – Crushing load – Euler's formula - Equivalent length of a column – slenderness ratio – Limitation of Euler's formula - Long columns subjected to eccentric loading – Rankine's formula - Straight line formula – John's parabolic formula - Columns with eccentric load.

Beam columns: Laterally loaded struts subjected to uniformly distributed and concentrated loads.

UNIT – III

Direct and bending stresses: Combined bending and direct Stresses – Column subjected to an Eccentric load - core of a section - determination of stresses in the case of retaining walls, chimneys and dams – conditions for stability – Overturning and sliding – stresses due to direct loading and bending moment about both axis.

UNIT – IV

Thin cylinders: Thin cylindrical shells subjected to internal pressure – Circumferential or hoop stress, longitudinal stress – Efficiency of a joint – Effect of internal pressure on the dimensions of a thin cylindrical shell – Thin spherical shell – Change in dimensions of a thin spherical shell due to an internal pressure.

Thick cylinders: Stresses in a thick cylindrical shell – distribution of hoop and radial stresses across thickness – Stresses in compound thick cylinders.

UNIT – V

Unsymmetrical bending: Introduction – Principal Moment of Inertia – Stress in Unsymmetrical bending – Deflection of beams in unsymmetrical bending – Method for finding bending stress in Unsymmetrical bending – Applications.

Shear centre: Shear centre – Shear centre for channel, Angle and I sections.

V. TEXT BOOKS:

1. Mechanics of Materials by Dr. B.C Punmia, Dr.Ashok Kumar Jain and Dr. ArunKumarJain 2017.
2. Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt. Ltd.2009.
3. Strength of Materials by R. K Rajput, S. Chand & Company Ltd.2022.

VI. REFERENCES:

1. Strength of materials by S.S. Rattan, Tata McGrawhill publications. 2008
2. Strength of materials by S.S. Bhavikatti, Vikas Publishing house.2013.
3. Strength of Materials by T.D. Gunneswara Rao and M. Andal, Cambridge Publishers. 2018.
4. Strength of Materials (Part 1) by S. Timoshenko, CBS Publishers & Distributors. 1940.
5. Strength of Materials by B.S. Basavarajaiah and P. Mahadevappa, 3rdEdition, Universities Press.2010.
6. Strength of Materials by R. S. Khurmi, S. Chand Publications. 2006.
7. Strength of Materials by R. Subramanian, Oxford University Press. 2010.

VII. WEB REFERENCES:

1. http://www.nptelvideos.in/2012/11/strength-of-materials-%20prof.html
2. http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-050-solid-mechanics-fall-%20%20%202004/lecturenotes/
3. http://www.youtube.com/watch?v=coRgpxG2pyY&list=PLLbvVfERDon3oDfCYxkwRct1Q6YeOzi9g

2440125 - BASIC STRUCTURAL ANALYSIS

B. Tech. II Year II Sem

L	T	P	C
3	1	0	4

Pre-requisites: Strength of Materials I & II

I. COURSE OVERVIEW:

The course of Structural Engineering comprises a set of fundamental theorems of mechanics that obey physical laws required to study and predict the behavior of structures for computation of deformations, internal forces and stresses. This course mainly deals with analysis of propped cantilever and fixed beams. And also the energy, force and displacement methods for the analysis of arches, determinate and indeterminate beams and trusses. This course also includes the effects of rolling loads on bridge girders and truss girders. Through this course content engineers can analyze the response of various structural members under different loading conditions for design, safety and serviceability.

II. COURSE OBJECTIVES:

The objectives of the course are

1. To differentiate the statically determinate and indeterminate structures, analyse the propped cantilever and fixed beams
2. To Analyse the pin jointed plane frames under different loading positions.
3. To understand the energy methods used to derive the equations to solve engineering problems
4. To understand the nature of stresses developed in perfect frames and three hinged arches for various types of simple loads
5. To Analyse the statically indeterminate members such as continuous beams and for various types of loading by slope deflection, moment distribution method and theorem of three moments method.
6. To evaluate the Influence on a beam for different static & moving loading positions

III. COURSE OUTCOMES:

At the end of the course the student will able to

1. Analyse propped cantilever and fixed beams
2. Analyse the pin jointed plane frames
3. Evaluate the normal thrust, radial shear, bending moment of three hinged arch.
4. Analyse the beams and frames using slope and deflection, moment distribution and theorem of three moments method
5. Evaluate the structure under moving loads and draw the Influence line diagram

IV. SYLLABUS:

UNIT - I

PROPPED CANTILEVER AND FIXED BEAMS

Static and kinematic indeterminacies for beams - Analysis of Propped cantilever and fixed beams subjected to different types of loads - Deflection of Propped cantilever and fixed beams - effect of sinking of support. Elastic curve.

UNIT - II

THEOREM OF THREE MOMENTS AND ANALYSIS OF TRUSSES

Theorem of three moments – analysis of continuous beams – shear force and bending moment diagrams.

Types of trusses – Perfect, Imperfect and Redundant pin jointed plane frames – Determinate trusses- Method of joints, method of sections and tension coefficient method for determinate perfect pin jointed plane frames subjected to vertical loads, horizontal loads and inclined loads.

UNIT - III

ENERGY THEOREMS AND THREE HINGED ARCHES

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

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 - Normal Thrust and radial shear and bending moment - Geometrical properties of parabolic and circular arches - Three hinged parabolic circular arches having supports at different levels.

UNIT - IV

SLOPE DEFLECTION AND MOMENT DISTRIBUTION METHOD

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

Moment Distribution Method and its application to continuous beams with and without settlement of supports. Shear force and bending moment diagrams and Elastic curve.

UNIT – V

MOVING LOADS AND INFLUENCE LINES

Introduction - maximum SF and BM at a given section and absolute maximum shear force and bending moment due to single concentrated load, uniformly distributed load longer than the span, uniformly distributed load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load.

Definition of influence line for shear force and bending moment - load position for maximum shear force and maximum bending moment at a section - Point loads, uniformly distributed load longer than the span, uniformly distributed load shorter than the span.

V. TEXT BOOKS:

1. Basic Structural Analysis by KU Muthu et al., I.K. International Publishing House Pvt. Ltd. 2017.
2. Indeterminate Structural Analysis by KU Muthu et al., I.K. International Publishing House Pvt. Ltd. 2014.
3. Analysis of Structures, Vol & II, Vazirani.V.N and Ratwani, M.M, Khanna Publishers, 2015.
4. Structural Analysis Vol I & II by G.S.Pandit and S.P. Gupta, Tata McGraw Hill Education Pvt. Ltd. 2008
5. Punmia. B.C, Ashok Kumar Jain & Arun Kumar Jain, Theory of structures, Laxmi Publications, New Delhi, 2004.
6. R. Vaidyanathan & P. Perumal, Structural Analysis Vol I & II, (Fourth Edition), Laxmi Publications, New Delhi, 2016.

VI. REFERENCES:

1. William Weaver, J and James M.Gere, Matrix analysis of framed structures, CBS Publishers & Distributors, Delhi,1995
2. Hibbeler, R.C.,Structural Analysis, VII Edition, Prentice Hall, 2012.
3. Reddy.C.S, "Basic Structural Analysis",Tata McGraw Hill Publishing Company,2005.
4. Rajasekaran. S, & G. Sankarasubramanian., "Computational Structural Mechanics", PHI Learning Pvt. Ltd, 2015
5. Negi L.S.and Jangid R.S.,Structural Analysis, Tata McGraw Hill Publishing Co.Ltd.2004.
6. Structural analysis T. S Thandavamoorthy, Oxford university Press, 2011

VII. WEB REFERENCES:

1. http://www.nptelvideos.in/2012/11/strength-of-materials- prof.html
2. http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-050-solid-mechanics-fall-2004/lecturenotes/
3. https:://www.youtube.com/watch?v=coRgpxG2pyY&list=PLLbvVfERDon3oDfCYxkwRct1Q6YeOzi9g

2440126 – HYDRAULICS AND HYDRAULIC MACHINERY

B. Tech. II Year II Sem

L	T	P	C
3	0	0	3

Pre-requisites: Fluid Mechanics

I. COURSE OVERVIEW:

This course is intended to introduce basic principles of fluid mechanics. It is further extended to cover the application of fluid mechanics by the inclusion of fluid machinery especially water turbine and water pumps. The use of fluid machinery, turbines pumps in general and in power stations in getting as accelerated fill up. Thus, there is a great relevance for this course for mechanical technicians. The Mechanical technicians have to deal with large variety of fluids like water, air, steam, ammonia and even plastics. The major emphasis is given for the study of water. However, the principle dealt with in this course will be applicable to all incompressible fluids.

II. COURSE OBJECTIVES:

The objective of the course is

1. To define the fundamental principles of water conveyance in open channels.
2. To discuss and analyze the open channels in uniform and Non-uniform flow conditions.
3. To study the characteristics of hydroelectric power plant and its components.
4. To analyze and design of hydraulic machinery and its modeling

III. COURSE OUTCOMES:

At the end of the course the student will able to

1. Apply knowledge of fluid mechanics in addressing problems in open channels and hydraulic machinery.
2. Analyse discharge in uniform, gradually and rapidly varied flows in open channel section
3. Apply dimensional analysis and Assess different hydraulic machinery devices and its principles utilized in hydropower development.
4. Evaluate the performance and efficiency of different types of turbines
5. Evaluate the characteristics of centrifugal pumps and estimation of hydropower potential.

IV. SYLLABUS:

UNIT – I

OPEN CHANNEL FLOW – I

Introduction to Open channel flow-Comparison between open channel flow and pipe flow, Classification of open channels, Classification of open channel flows, Velocity distribution.

Uniform flow – Characteristics of uniform flow, Chezy's, Manning's and Bazin formulae for uniform flow – Factors affecting Manning's Roughness Coefficient "n". Most economical sections. Computation of Uniform flow, Normal depth.
Critical Flow: Specific energy – critical depth - computation of critical depth – critical, sub critical and super critical flows-Channel transitions.

UNIT – II
OPEN CHANNEL FLOW – II
Non-uniform flow – Gradually Varied Flow - Dynamic equation for G.V.F; Classification of channel bottom slopes – Classification and characteristics of Surface profiles – Computation of water surface profiles by Numerical and Analytical approaches. Direct step method.
Rapidly varied flow: Elements and characteristics (Length and Height) of Hydraulic jump in rectangular channel– Types, applications and location of hydraulic jump, Energy dissipation and other uses – Positive and Negative Surges (Theory only).

UNIT - III
DIMENSIONAL ANALYSIS AND HYDRAULIC SIMILITUDE: Dimensional homogeneity – Rayleigh's method and Buckingham's pi methods – Dimensionless groups. Similitude, Model studies, Types of models.
Application of dimensional analysis and model studies to fluid flow problems. Distorted models.
BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, expressions for work done and efficiency – Angular

UNIT - IV
HYDRAULIC TURBINES – I: Elements of a typical Hydropower installation – Heads and efficiencies – Classification of turbines – Pelton wheel – Francis turbine – Kaplan turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube – Classification, functions and efficiency.
HYDRAULIC TURBINES – II: Governing of turbines – Surge tanks – Unit and specific turbines – Unit speed – Unit quantity – Unit power – Specific speed – Performance characteristics – Geometric similarity – Cavitation. Selection of turbines.

UNIT - V
CENTRIFUGAL PUMPS: Pump installation details – classification – work done – Manometric head – minimum starting speed – losses and efficiencies – specific speed. Multistage pumps – pumps in parallel – performance of pumps – characteristic curves – NPSH – Cavitation.
HYDROPOWER ENGINEERING: Classification of Hydropower plants – Definition of terms – load factor, utilization factor, capacity factor, estimation of hydropower potential.

V. TEXT BOOKS:

1. Fluid Mechanics by Modi and Seth, Standard Book House. 2019.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015
3. Fluid mechanics & Hydraulic Machines, Domkundwar & Domkundwar Dhanpat Rai &Co. 2014.

VI. REFERENCES:

1. Fluid Mechanics by R. C. Hibbeler, Pearson India Education Services Pvt. Ltd. 2022.
2. Fluid Mechanic & Fluid Power Engineering by D. S. Kumar (Kataria & Sons Publications Pvt. Ltd.). 2013.
3. K. Subramanya, 'Theory and Applications of Fluid Mechanics', Tata McGraw Hill.1993.
4. Open channel flow by V.T. Chow (McGraw Hill Book Company). 1959.
5. Introduction to Fluid Mechanics and Fluid Machines by SK Som, Gautam Biswas, Suman Chakraborthy, Mc Graw Hill Education (India) Private Limited.2017.
6. Hydraulic Machines by Banga & Sharma (Khanna Publishers). 2019.

VII. WEB REFERENCES:

http://nptel.ac.in/courses/112104117/
http://nptel.ac.in/courses/105103096/
http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/machine/ui/TOC.htm

2440127 – BUILDING MATERIALS, CONSTRUCTION AND PLANNING

B. Tech II Year II Sem

L	T	P	C
3	0	0	3

Prerequisites: Elements of Civil Engineering

I. COURSE OVERVIEW:

The construction materials course introduces students to materials used in different construction projects from building materials to ground and foundation make-up. Specific materials studied include soil, metals, concrete and wood. This course also covers finishes and materials for the exterior and interior of buildings. Skills are developed to assess the effect materials have on a building projects related to structure, fire safety, building codes as well as market demand. A large part of construction management has to do with overseeing entire building projects or multiple construction projects. This course helps to develop students' skills in managing projects and people. This course may be taken at different times in a construction management program with an emphasis on residential or commercial construction.

II. COURSE OBJECTIVES:

The objective of the course is

1. To learn various construction materials for constructing a building.
2. To know the process involved to manufacture of cement, tests on cement, grades of concrete, tests on concrete, NDT, admixtures used for concrete
3. To understand different building components
4. To understand Plumbing services using different materials
5. To know the types of form work, utilization, preparation of mortars for finishing work.
6. To learn Bye laws to construct a building

III. COURSE OUTCOMES:

At the end of the course the student will able to

1. Understand stones, bricks, tiles, timber and other type of modern material, its properties and applications in construction
2. Analyse properties of cement, concrete, admixtures and study its properties and uses in construction
3. Apply the concepts in functioning of buildings components and building services.
4. Analyse load bearing and framed structure and list the types of form work and uses and also preparation of mortars for finishing work.
5. Understand principles of building planning and bye laws to construct a building.

IV. SYLLABUS:

UNIT I

Stones and Bricks, Tiles: Building stones – classifications and quarrying – properties – structural requirements – dressing. Stone masonry – types; Bricks – Composition of Brick earth – manufacture and structural requirements, Fly ash, Ceramics. Brick masonry – types – bonds.

Timber and Other modern materials: Wood - structure – types and properties – seasoning – defects; alternate materials for Timber – GI / fibre – reinforced glass bricks, steel & aluminum, Plastics. Geomembranes and Geotextiles for earth reinforcement

UNIT - II

Cement, Concrete and Admixtures: Cements – Grade of cements - Ingredients of cement – Types and properties of cement - Manufacture – Chemical composition – Hydration - field & lab tests on cement.

Concrete – Types – Properties – Various test on concrete.

Admixtures – mineral & chemical admixtures – uses.

UNIT – III

Building Components: Lintels, Arches, walls, stair cases, floors – types of floors, roofs -types of roofs – Damp Proof Course ; Joinery – doors – windows – types. foundations – types.

Building Services: Plumbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; Acoustics – characteristic – absorption – Acoustic design; Fire protection – Fire Harzards – Classification of fire resistant materials and constructions.

UNIT – IV

Structural Systems: Load Bearing Structure - Framed Structure - Load transfer mechanism.

Form work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

Mortars and Finishers: Lime and Cement Mortars - Preparation of mortar Plastering, Pointing, Painting, Claddings – Types – Tiles.

UNIT – V

Stairs and Building Planning: Stairs – Types – Requirement of good stairs - Principles of Building Planning, Classification of buildings and Building by laws.

V. TEXT BOOKS:

1. Building Materials and Construction by Arora & Bindra, Dhanpat Roy Publications.
2. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.

VI. REFERENCES:

1. Building Materials and Construction by G C Sahu, Joygopal Jena McGraw hill Pvt Ltd 2015.
2. Building Materials by Duggal, New Age International.
3. Building Materials by P. C. Varghese, PHI Publications.
4. Building Construction by PC Varghese PHI Publications.
5. Construction Technology – Vol – I & II by R. Chubby, Longman UK.
6. Alternate Building Materials and Technology by Jagadish, Venkatarama Reddy and others; New Age Publications.

VII. WEB REFERENCES:

http://nptel.ac.in/courses/105102088/
http://nptel.ac.in/courses/105101088

2440202 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common for Civil & Mechanical)

B.Tech II Year II Sem	**L**	**T**	**P**	**C**
	2	**0**	**0**	**2**

COURSE OVERVIEW:

Basic Electrical and Electronics Engineering serves as a fundamental cornerstone across various engineering disciplines. Civil engineers benefit from understanding basic electrical principles to grasp the intricate electrical systems present within buildings. This knowledge encompasses wiring layouts, lighting setups, power distribution mechanisms, and safety protocols, enhancing their ability to design and manage infrastructural projects effectively. Moreover, collaboration between mechanical and electrical engineers is pivotal in addressing common challenges and innovating new products, technologies, or structures. This synergy harnesses the expertise of both fields to develop comprehensive solutions that often transcend the boundaries of individual disciplines.

Prerequisite: NIL

COURSE OBJECTIVE: The students will be able

- To understand the concepts of electrical circuits and its fundamental elements.
- To study and understand the different types of DC machines and Transformers.
- To import the knowledge of electrical installations and methods for power factor improvement.
- To introduce the concepts of basic semiconductor devices and their characteristics.
- To understand the digital circuits to perform Boolean operations.

COURSE OUTCOMES: After successful completion of the course, students should be able

- To analyze and solve electrical circuits using network laws.
- To design, analyze, and optimize electrical systems for a wide range of applications
- To introduce components of Low Voltage Electrical Installations.
- To identify and characterize diodes and various types of transistors.
- To design and analyze electronic circuits.

MODULE-I: ELECTRICAL CIRCUITS [L=10]

DC Circuits: Basic Circuit elements, Classification, Ohm's Law, KVL & KCL, Series, Parallel, Star-Delta Connections, Mesh and Nodal Analysis (Simple Problems).

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

MODULE -II: ELECTRICAL MACHINES

Transformers: Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency.

Dc Machines: Construction and working principle of DC generators, EMF equation, Working Principle of DC motor, Torque Equation, Speed Control methods of DC Motors.

MODULE –III: ELECTRICAL INSTALLATIONS

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing.

Batteries: Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

MODULE –IV: DIODES & TRANSISTORS

Diodes: Classification of solids based on energy band theory- Instrinsic Semi Conductors- Extrinsic Semiconductors- P-type and N-type- PN junction- Zener effect- Zener diode characteristics- Half wave and full wave rectifiers.

Bipolar Junction Transistor (BJT): CB, CE, CC configuration and characteristics- Biasing circuits – Class A, B and C amplifiers.

MODULE –V: DIGITAL LOGIC DESIGN

Binary number system, Boolean algebra, Logic Gates**:** AND, OR, NOT, NAND, NOR, Exclusive OR and NOR gates, Flip flops, half and full adders, Registers, Counters, A/D and D/A conversion.

Text Books:

1. "Basic Electrical and electronics Engineering" –M S Sukija, TK Nagasarkar Oxford University 2005.
2. "Basic Electrical and electronics Engineering" - D P Kothari, I J Nagarath, McGraw Hill Education, 3rd edition, 2010.
3. "Modern Digital Electronics" - R. P. Jain, Tata McGraw-Hill, 3rd Edition, 2007.

Reference Books:

1. "Circuit Theory: Analysis and Synthesis" – A.Chakrabarti, Dhanpath Rai & Co., 7th Edition, 2018.
2. "Electrical Machines (Vol. 1)" - J.B. Gupta, S K Kataria and Sons, 2012.
3. "Electronic Devices and Circuits" – R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
4. "Millman's Electronic Devices and Circuits" – J. Millman and C. C. Halkias, SatyabrataJit, TMH, 2/e,1998.
5. "Fundamentals of Electrical Engineering and Electronics" - BL Theraja, S. Chand Publishing, 2006.
6. "Electrical and Electronics Technology" - E. Hughes, Pearson, 2010.

2440179 – COMPUTER AIDED DRAWING LABORATORY

B. Tech. II Year II Sem

L	T	P	C
0	0	2	1

Pre-requisites: Computer Aided Engineering Graphics

I. COURSE OVERVIEW:

Computer aided drawing is a technique where engineering drawing are produced with the assistance of a computer. It deals with execution of building drawing which includes plan, section and elevation. Planning of building help us to prepare estimation and to execute building.

II. COURSE OBJECTIVES:

The objective of the course is

1. To teach the student usage of Auto cad, basic drawing fundamentals in various civil engineering applications, especially in building drawing.
2. To teach students the basic commands and tools necessary for professional 2D drawing, 3D drawing and drafting using AutoCAD
3. To sketch and take field dimensions.
4. To take data and transform it into graphic drawings.
5. To learn basic engineering drawing formats

III. COURSE OUTCOMES:

At the end of the course the student will able to

1. Understand CAD software and basic functions
2. Apply CAD software to draw plans of Single storied and multi-storeyed buildings
3. Apply CAD software to draw plan, section and elevations of building
4. Apply CAD software to draw building components like doors, windows and roof trusses
5. Apply CAD software to draw single and multi-storeyed buildings using Auto CAD 3-D.

IV. SYLLABUS:

List of Experiments

1. Introduction to computer aided drafting & coordinate system.
2. Exercise on Draw & Modify tool bars.
3. Exercise on Layer, Dimension, Texting & Block tool bars.
4. Drawing a plan of Building and dimension using layers.
5. Drawing a plan, section and elevation of building (load bearing structure)

6. Developing sections and elevations for given
   a) Single storied buildings b) Multi storied buildings. (Framed structure)
7. Drawing of building components like walls, lintels, Doors, and Windows.
8. Introduction to 3 – D view.
9. Creating single storey residential building in Auto CAD 3-D
10. Creating two storey residential building in Auto CAD 3-D

V. REFERENCES:

1. Computer Aided Design Laboratory by M. N. Sesha Praksh & Dr. G. S. Servesh – Laxmi Publications.
2. Engineering Graphics by P. J. Sha – S. Chand & Co.

2440180 – FLUID MECHANICS AND HYDRAULIC MACHINERY LABORATORY

B.Tech. II Year II Sem.

L	T	P	C
0	0	2	1

Pre-requisites: Fluid Mechanics, Hydraulics and Hydraulic machinery

I. COURSE OVERVIEW:

The Fluid Mechanics and Hydraulic Machinery Course is an indispensable supplement to the theory. It covers measurement techniques of fluid mechanics, error analysis in experimental works and analysis of assumptions in the theory of fluid mechanics. Study the properties of fluid in rest or in motion is an important area in civil engineering. Study of working principles of turbine and pumps is more important in irrigation, dam construction power producing.

II. COURSE OBJECTIVES:

The objective of the course is

1. To identify the behavior of analytical models introduced in lecture to the actual behavior of real fluid flows.
2. To explain the standard measurement techniques of fluid mechanics and their applications.
3. To illustrate the students with the components and working principles of the Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
4. To analyze the laboratory measurements and to document the results in an appropriate format.

III. COURSE OUTCOMES:

At the end of the course the student will able to

1. Understand the basic measurement techniques of fluid mechanics and its appropriate application.
2. Evaluate Coefficient of discharge for a small orifice by a constant head method
3. Analyse minor and major losses in pipe flow, energy loss in hydraulic jump
4. Evaluate Manning's and Chezy's constants for Open channel flow
5. Evaluate performance characteristics of hydraulic turbines and pumps

IV. SYLLABUS:

List of Experiments:

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

V. REFERENCES:

1. C.S. P.Ojha, R. Berndtsson and P. N. Chandarmouli, 'Fluid Mechanics and Machinery', Oxford University Press, 2010.
2. P M Modi and S M Seth, 'Hydraulics and Fluid Mechanics', Standard Book House. 2019
3. K. Subramanya, 'Theory and Applications of Fluid Mechanics', Tata McGraw Hill. 1993.
4. R.L. Daugherty, J.B. Franzini and E.J. Finnemore, 'Fluid Mechanics with Engineering Applications', International, Student Edition, McGraw Hill. 1985.

2440272 - BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY
(Common to Civil & Mechanical)

B.TECH II YEAR	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

COURSE OVERVIEW:

The course covers a broad range of fundamental concepts in electrical and electronics engineering, which is essential for building a strong foundation in the field. It includes fundamental concepts to know about electrical equipments, panels and operations. By providing a comprehensive understanding of basic principles such as circuit analysis, semiconductor devices, power systems, and electronic components, students can develop the knowledge and skills necessary to tackle more advanced topics and applications in their studies or professional careers.

Pre-requisite: Basic Electrical and Electronics Engineering

COURSE OBJECTIVE: The students will be able to

- To introduce the concepts of electrical circuits and its components.
- To understand three phase AC circuits.
- To examine the performance of Single Phase Transformers (on no-load and on load).
- To expose the students to the operation of DC Motors.
- To introduce components such as diodes, BJTs and FETs their switching characteristics.
- Acquire the knowledge on numerical information in different forms and Boolean Algebra theorems.

COURSE OUTCOMES: After successful completion of the course, students should be able to

- Analyze and solve electrical circuits using network laws.
- Understand the concept of three-phase power and the distinction between active (real) power, reactive power, and apparent power.
- Understand the interrelationship between electric and magnetic circuits, such as in the case of electromagnetic induction and mutual inductance.
- Analyze the relationships between voltages, current, magnetic flux, and mechanical torque in electrical machines, and their speed-torque characteristics.
- Exploring the current-voltage (I-V) characteristics of a PN junction diode, understanding the operation and circuit configuration of full-wave rectifiers.
- Analyze the Boolean functions using various Logic Gates.

List of experiments / demonstrations:

PART A: ELECTRICAL

1. Verification of KVL and KCL.
2. Determination of Impedance in Series RL, RC and RLC Circuits.
3. Measurement of Active and Reactive Power in a balanced Three-phase circuit.
4. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer.
5. Load Test on Single Phase Transformer (Determination of Characteristics).
6. Performance Characteristics of a Separately Excited DC Shunt Motor.

PART B: ELECTRONICS

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

REFERENCE BOOKS:

1. "Circuit Theory: Analysis and Synthesis" – A.Chakrabarti, Dhanpath Rai & Co., 7th Edition, 2018.
2. "Electrical Machines (Vol. 1)" - J.B. Gupta, S K Kataria and Sons, 2012.
3. "Electronic Devices and Circuits" – R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
4. "Millman's Electronic Devices and Circuits" – J. Millman and C. C. Halkias, SatyabrataJit, TMH, 2/e,1998.
5. "Fundamentals of Electrical Engineering and Electronics" - BL Theraja, S. Chand Publishing, 2006.
6. "Electrical and Electronics Technology" - E. Hughes, Pearson, 2010.

2440197: GEOGRAPHIC INFORMATION SYSTEMS LABORATORY

B.Tech. II Year II Sem.

L	T	P	C
0	0	2	1

I. COURSE OVERVIEW:

This course introduces students to Geographic Information systems using QGIS for spatial data manipulation and analysis, focusing on applications in civil engineering. Students will learn to geo-reference data, create vector layers, and perform spatial analyses such as network analysis, buffering, and terrain modeling. By the end of the course, students will be able to design, visualize, and export professional maps for infrastructure planning and decision-making.

II. COURSE OBJECTIVES:

1. To introduce students to the fundamentals of GIS and its graphical user interface (GUI) for spatial data analysis.
2. To develop skills in geo-referencing and integrating various data formats, such as satellite images, top sheets, and AutoCAD base maps.
3. To provide practical experience in vector and raster data manipulation, including analysis and creation of new spatial features.
4. To enable students to use GIS tools effectively for spatial analysis, including clipping, buffering, and terrain modeling.
5. To equip students with the ability to design, visualize, and export professional-grade maps and analyze infrastructure systems, such as road networks.

III. COURSE OUTCOMES:

1. Identify and navigate the QGIS interface to use essential GIS tools for spatial data manipulation and analysis.
2. Use geo-referencing techniques on non-spatial data and integrate various sources of geographic information into a GIS framework.
3. Construct vector layers and analyze spatial data to solve real-world civil engineering challenges.
4. Perform advanced GIS operations, including network analysis, buffering, and clipping, to support civil engineering projects and planning.
5. **Create**, **visualize**, and **export** detailed and well-designed map layouts for effective communication of spatial data.

IV.SYLLABUS

List of Experiments:

1. Exploring the QGIS Graphical User Interface (GUI)
2. Geo-referencing and projections
3. Raster Analysis Techniques
4. Generating New Vector Files for Point, Line, and Polygon Features
5. Digitizing and Assigning Coordinates in GIS
6. Using GIS Tools like Clip and Buffer for Mapping
7. Designing and Exporting Map Layouts in QGIS
8. Mapping and Analyzing Road Networks
9. Generating Contour Maps
10. Generation of Digital Elevation Models (DEMs)
11. Creating Land Use Land Cover (LULC) Maps

Requirements for the lab:

1. QGIS software-open sources
2. Computers.

V. REFERENCES:

Anji Reddy, M. (2002) *Remote Sensing and Geographical Information System*. 2nd Edition, B.S. Publications, Hyderabad

2440021 - ENVIRONMENTAL SCIENCE
(COMMON TO CIVIL.EEE, MECH, ECE, CSE AND IT)

B.Tech. II Year II sem

L	T	P	C
3	0	0	0

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations
- Understanding the importance of natural resources
- Understanding the different standards of environmental pollution

Course Outcomes: Based on this course, the Engineering graduate will

- Understand the technologies on the basis of ecological principles
- Apply the environmental regulations which in turn helps in sustainable development.
- Understand the various classifications of ecosystems and natural resources.
- Apply environmental regulations to different acts.
- Evaluate the values of social, ethical and aesthetic.

UNIT-I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, Field visits.

Learning Outcomes:

- Understand the importance of ecosystem.
- Explain the various classifications.
- Apply to different cycles.
- Analyse the importance field visit.
- Evaluate the flow of energy.

UNIT-II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams:benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

Learning Outcomes:

- Understand the importance of natural resources.
- Explain the various classifications of natural resources.
- Apply to different renewable resources.
- Analyse the usage of resources.
- Evaluate the value of renewable and non renewable energy sources.

UNIT-III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

Learning Outcomes:

- Understand the importance of Biodiversity.
- Explain the types of Biodiversity.
- Apply to different Biotic Resources.
- Analyse the importance Biodiversity And Biotic Resources.
- Evaluate the values of social, ethical and aesthetic.

UNIT-IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types ofpollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:**Wastewater Treatment methods: Primary, secondary and Tertiary.Overview of air pollution control technologies, Concepts of bioremediation. **GlobalEnvironmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

Learning Outcomes:

- Understand the importance of Pollution and control technologies.
- Explain the classifications of pollutions.
- Apply to environment.
- Analyse the importance waste management.
- Evaluate the value of Ozone depletion and Ozone depleting substances.

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act-1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects.Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building.

Learning Outcomes:

- Understand the importance of Environmental Policy, Legislation.
- Explain the various acts.
- Apply to different Environmental Management Plan.
- Analyse the importance of environmental education.
- Evaluate the value of green building.

TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.

2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.

III-I

2450128 - Design of Reinforced Concrete Elements and Drawing

B. Tech. III Year I Sem	**L**	**T**	**P**	**C**
Pre-requisites: Building Materials, Strength of Materials I & II and Basic structural analysis	**3**	**1**	**0**	**4**

Course Objectives: The objective of the course is

1. To discuss the fundamentals of reinforced concrete structural properties and behaviours.
2. To state the optimum design criteria and procedures.
3. To explain the basic principles and design methods of reinforced concrete members.
4. To clarify code requirements and specifications and explain the background of code.
5. To outline professional and contemporary issues in the design and fabrication of reinforced concrete members.
6. To sketch reinforcement details of reinforced concrete members.

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

1. Understand the concept of methods of design, also design of slab and beam by working stress method.
2. Design of singly and doubly reinforced concrete beam
3. Understand the concept of bond, design of shear and torsional reinforcement.
4. Design of slab.
5. Design of columns and footings.

UNIT - I

INTRODUCTION: CONCEPT OF REINFORCED CEMENT CONCRETE

Introduction IS: 456-2000, Materials & other properties, compressive strength, tensile strength, creep, shrinkage, Elastic Deformation, Suitability of steel in concrete, stress-strain relation of steel, Methods of design, Design of slab and beam by Working stress method.

Learning Outcomes:

At the end of the unit, student should able to,

- To get familiar with IS:456-2000 code
- Understand the properties of concrete and steel
- Understand the concept of RCC
- To know the methods of RCC design

UNIT - II
DESIGN OF BEAMS
Loads and Load Combinations, safety factors- Limit State method, Limit State of Collapse **Singly Reinforced Concrete Beams** - Stress Block Parameters, limiting depth of neutral axis, Ultimate moment of resistance. Under reinforced, Balanced & Over reinforced sections.

Doubly Reinforced Concrete Beams: Doubly reinforced concrete beam and its necessity, Design of a doubly reinforced concrete beam, Design of L and T-beams. Economical depth – Detailing of reinforcement

Learning Outcomes:
At the end of the unit, student should able to,

- Understand and implement the load calculations for different conditions.
- Analyse and Design RCC beams for different loading conditions.
- Calculate the bearing capacity of slab beam combo in flanged beams.

UNIT - III
BOND, SHEAR AND TORSION
Concept of bond, Permissible bond stresses for plain and deformed bars as per BIS code of practice, minimum length, and standard hook.
Design of shear using IS:456-2000, Design of stirrups
Design of shear using IS:456-2000, Design of Torsional Reinforcement

Learning Outcomes:
At the end of the unit, student should able to,

- Analyse the importance and bond between concrete and steel in RCC
- Implement the codal provisions for bond, shear and torsion in design
- Design beams for all loading conditions

UNIT - IV
DESIGN OF SLABS
Design of Two-way slabs with different end conditions, one way slab, and continuous slab Using IS Method - Detailing of reinforcement, Limit state design for serviceability for deflection, cracking and codal provisions

Learning Outcomes:
At the end of the unit, student should able to,

- Understand the concept of slab
- To be able to distinguish between different varieties of slab and loading conditions
- Introduce to limit state of serviceability

UNIT - V

DESIGN OF COLUMNS AND FOOTINGS

Short Column - Columns with axial loads, uniaxial and bi-axial bending – Use of design charts- Long column — Design of long columns - IS Code provisions

Different types of footings –Design of flat isolated square, rectangular, circular footings and combined footings for two columns — Detailing of reinforcement.

Learning Outcomes:

At the end of the unit, student should able to

- Design of Columns
- Understand the codal provisions and load combinations on members
- Implement RCC concepts to analyse and design foundations

TEXT BOOKS:

1. Dr. B.C. Punmia and A.K.Jain, "Limit State Design of Reinforced Concrete", Lakshmi Publication, 2007.
2. Dr. H.J. Shah, "Reinforced Concrete (Elementary Reinforced Concrete), Charotar Publishing House Pvt. Ltd., 11th Edition.
3. P.C. Varghese, "Limit State Design of Reinforced Concrete", Prentice Hall of India Pvt Ltd, New Delhi.

REFERENCES:

1. S. Unnikrishnan Pillai and Devdas Menon, "Reinforced Concrete Design", McGraw HillEducation, 3rd Edition.
2. M.L. Gambhir, "Fundamentals of Reinforced Concrete Design" PHI Learning Edition, 2012.
3. Arthus H. Nilson, David Darwin and Chorles W. Dolar, "Design of Concrete Structures",Tata McGraw Hill, 2011.
4. S.S.Bhavikatti, "Design of RCC Structural Elements" :Vol-1, New Age Publishers, 2008.

2450129 - CONCRETE TECHNOLOGY

	L	T	P	C
B. Tech. III Year I Sem				
Pre-Requisites: Building Materials, Construction and Planning	3	0	0	3

Course Objectives: The objective of the course is

1. To know different types of cement as per their properties for different field applications.
2. To understand Design economic concrete mix proportion for different exposure conditions and intended purposes.
3. To know field and laboratory tests on concrete in plastic and hardened stage.

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

1. Determine the properties of concrete ingredients such as cement, sand, coarse aggregate by conducting different tests.
2. Classify and test on aggregate.
3. Understand the different workability and strength tests.
4. Apply advanced laboratory techniques to characterize cement-based materials.
5. Perform mix design and engineering properties of special concretes such as high-performance concrete, self-compacting concrete, and fiber reinforced concrete.

UNIT - I

Cement: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrated cement – Tests on physical properties – Different grades of cement. Admixtures: Types of admixtures – mineral and chemical admixtures.

Learning Outcomes:

At the end of the unit, student should able to

- Understand the different types of cement, grades and their physical properties
- Understand the different types of admixtures

UNIT - II

Aggregates: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate — Bulking of sand — Deleterious substance in aggregate — Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus — Grading curves — Grading of fine, Manufactured sand and coarse Aggregates — Gap graded aggregate — Maximum aggregate size- Properties Recycled aggregate.

Learning Outcomes:

At the end of the unit, student should able to

- Understand the different types of aggregates and tests on those aggregate to find their physical and thermal properties.

UNIT - III

Fresh Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing, vibration and re-vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

Learning Outcomes:

At the end of the unit, student should able to

- Understand the term workability of concrete
- Explain the different tests on workability of concrete
- Know the effect of excess water, vibration in quality of concrete

UNIT - IV

Hardened Concrete: Water / Cement ratio – Abram's Law – Gel/space ratio – Gain of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing. Testing of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT Elasticity, Creep & Shrinkage – Modulus of elasticity – Dynamic modulus of elasticity – Posisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

Learning Outcomes:

At the end of the unit, student should able to

- Understand the term hardened concrete, their properties and the different test to find its strength
- Know the different NDT tests and their procedure to find the strength of concrete as per code.

UNIT - V

Mix Design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design. Special Concretes: Introduction to light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete.

Learning Outcomes:

At the end of the unit, student should able to

- Write the mix design as per codes

- Understand the different types of special concrete and to know the procedure to make it.

TEXT BOOKS:

1. Concrete Technology by M.S. Shetty. – S. Chand & Co.; 2004
2. Concrete Technology by A.R. Santhakumar, 2nd Edition, Oxford University Press, New Delhi
3. Concrete Technology by M. L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

REFERENCES:

1. Properties of Concrete by A. M. Neville, 5th edition, Pearson Publishers, 2012.
2. Concrete: Micro structure, Properties and Materials — P.K. Mehta and J.M. Monteiro, McGraw Hill Publishers
3. IS:10262-2019, Concrete Mix Proportioning — Guidelines (Second Revision), BIS, New Delhi
4. IS:516-2021, Hardened concrete — Method of Test, Part-1 Testing of strength of concrete, BIS, New Delhi.
5. IS:516-2018, Hardened concrete — Method of Test, Part-2 Properties of Hardened Concrete other than Strength, BIS, New Delhi
6. IS:516-2018, Hardened concrete — Method of Test, Part-4 Sampling, Preparing and Testing of concrete cores, BIS, New Delhi
7. IS:516-2018, Hardened concrete — Method of Test, Part-5 Non Destructive Testing of concrete, BIS, New Delhi
8. IS:516-2018, Hardened concrete – Method of Test, Part-8 Determination of modulus of elasticity, BIS, New Delhi

2450130 – SOIL MECHANICS

B. Tech. III Year I Sem	**L T P C**
Pre-requisites:-	**3 0 0 3**

Course Objective: The objective of the course is

1. To impart knowledge to classify the soil based on index properties and to assess their engineering properties based on the classification.
2. To familiarize the students about the fundamental concepts of compaction,
3. Understand the flow through soil, stress transformation,
4. Analyze stress distribution, consolidation in soil
5. Understand shear strength of soils.
6. To impart knowledge of design of both finite and infinite slopes.

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

1. Classify the soil and assess the engineering properties, based on index properties.
2. Understand the stress concepts in soils
3. Understand and identify the consolidation settlements in soils.
4. Determine the shear strength of soil
5. Analyze finite and infinite slopes.

UNIT - I
SOIL CLASSIFICATION AND COMPACTION
History — formation and types of soil — composition - Index properties — clay mineralogy structural arrangement of grains – description – Classification – BIS – US – phase relationship – Compaction theory – laboratory and field technology – field Compaction method – factors influencing compaction.

Learning Outcome:
At the end of the unit, students should able to,

- Classify the different types of soils
- Understand the structural arrangement of soils
- Assess the engineering properties of soils
- Understand the concept of compaction of soil
- Apply the concepts in the field.

UNIT - II
EFFECTIVE STRESS AND PERMEABILITY
Soil - water — Static pressure in water - Effective stress concepts in soils — Capillary phenomena– Permeability — Factors influencing permeability of soils -Darcy's law —

Determination of Permeability — Laboratory Determination (Constant head and falling head methods)

Learning Outcome:
At the end of the unit, students should able to,

- Understand the relationship between soil and water
- Interpret the stresses in soils
- Understand the concept of flow through different soils
- Evaluate the flow parameters using Darcy's law
- Identify the factors influencing permeability of soils.

UNIT - III
STRESS DISTRIBUTION AND SETTLEMENT
Stress distribution in homogeneous and isotropic medium – Boussines of theory – (Point load, Line load and UDL) Use of New marks influence chart –Components of settlement — Immediate and consolidation settlement – Factors influencing settlement – Terzaghi's one dimensional consolidation theory

Learning Outcome:
At the end of the unit, students should able to,

- Understand the concept of stress distribution and settlement
- Explain the Boussines theory
- Use the new marks influence chart
- Identify the components of settlement
- Understand the Terzaghi's one dimensional consolidation theory

UNIT - IV
SHEAR STRENGTH
Shear strength of cohesive and cohesion less soils — Mohr-Coulomb failure theory - Pore pressure parameters - Factors influences shear strength of soil— shear strength - Direct shear, Triaxial compression, Unconfined compression test and Vane shear test.

Learning Outcome:
At the end of the unit, students should able to,

- Understand the concept of shear strength of soils
- Explain the Mohr-Coulomb failure theory
- Identify the factors influencing permeability of soils.
- Assess the of shear strength of soils
- Evaluate the shear strength of soils using different equipments

UNIT - V

SLOPE STABILITY

Infinite slopes and finite slopes — Friction circle method – Use of stability number –Guidelines for location of critical slope surface in cohesive and c - φ soil – Slope protection measures.

Learning Outcome:

At the end of the unit, students should able to,

- Classify the types of slopes
- Understand the Friction circle method
- Use the stability number for slop analysis
- Identify the location of critical slope in different conditions
- Enlighten the slope protection measures

TEXT BOOKS:

1. Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi.2014
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).
3. Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publication, 3rd Edition, 2016.
4. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. NewDelhi, 16th Edition, 2017.
5. T.N. Ramamurthy and T.G. Sitharam, " Geotechnical Engineering", S. Chand Publishing, New delhi 2015.

REFERENCES:

1. Muni budhu, " Soil Mechanics and Foundations", John wiley & sons,INC.3rd Edition,
2. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations: Basic Geotechnics". Prentice-Hall,2006.
3. Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt. Ltd. New Delhi, 2010.
4. Braja M Das, "Principles of Geotechnical Engineering", Cengage Learning India Private Limited, 8th Edition, 2014.
5. Palanikumar.M., "Soil Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited Delhi,2013.
6. Venkatramaiah.C., "Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi, 2017.
7. Purushothama Raj. P., "Soil Mechanics and Foundations Engineering",2nd Edition, Pearson Education, 2013.

2450141 – PRE-ENGINEERED BUILDINGS

(Professional Elective – I)

B. Tech. III Year I Sem **L T P C**

Pre-Requisites: Design of steel structure, design of concrete structures **3 0 0 3**

Course Objectives: The objective of the course is

1. To introduce the concept and evolution of Pre-Engineered Building systems
2. To develop an understanding of various components of PEB systems
3. To familiarize students with design principles and codes
4. To enable students to perform design and analysis of typical PEB elements using manual methods and structural analysis software tools.
5. To create awareness about fabrication, transportation, and erection techniques used in PEB construction and the associated quality control and safety measures.

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

1. Classify different materials used for pre-engineered buildings
2. Identify codal provisions and understand an importance of standardization, modular construction, tolerances as per national building code of practice
3. Classify pre-engineered building components
4. Classify different design loads on pre-engineered buildings
5. Apply pre-engineered building design methodology

UNIT - I

Introduction

Introduction – Background – Necessity- Merits of Pre Engineered Buildings - Applications of PEB — Materials used for constructing of PEB. Difference between Conventional Steel Buildings and Pre Engineered buildings.

Course Learning Outcomes:

- Identify and describe the materials commonly used in the construction of PEBs and their properties.
- Summarize the advantages, merits, and potential applications of PEBs in industrial, commercial, and infrastructure projects.

UNIT - II

Components of PEB

Primary Frame System: Main frames, Gable End Frame - Secondary frame system: Sizes and Properties of Purlins and Girts, Bracing System: Rod, angle, Portal, Pipe bracing – Sheeting and Cladding: Roof Sheeting and Wall sheeting – Accessories: Turbo Ventilators, Ridge vents, Sky Lights, Louvers, Insulation, Stair cases, fire safety.

Learning Outcomes:

- Identify and describe the various components of a Pre-Engineered Building, including the primary, secondary, and cladding systems.

- The function and structural importance of primary framing systems such as main frames and gable end frames.

UNIT - III
Design Loads

Loads to be considered for design of PEB, Design of PEB frame under the influence of Dead, Live, Collateral, Wind, Seismic and Other Applicable Loads. Serviceability Limits as per code. **Learning Outcomes:**

- Classify the various types of loads acting on Pre-Engineered Buildings such as dead, live, collateral, wind, seismic, and other applicable loads.
- Apply relevant provisions from design codes (e.g., IS 875, IS 1893, etc.) for determining different design loads on PEB structures.

UNIT - IV
Codal Provisions for Design of Frame

Design Parameters of PEB Frames - Depth of the section, Depth to Flange width ratios, Thickness of Flange to thickness of Web ratio. d/tw, bf/tf ratios of sections as per IS code. Selection of Section as per Manufacturing Limitations. Analysis and Design of Rigid Frames. **Learning Outcomes:**

- Identify the key design parameters of PEB frames, including section depth, flange width, and thickness ratios.
- Perform the analysis and design of rigid frames of PEBs using codal provisions, considering stability, strength, and serviceability criteria.

UNIT - V
PEB FRAME CONNECTION DESIGN METHODOLOGY

Rigid Frame Moment Connection, Shear Connection, High strength bolts & grades, Lever arm, bolt Patten its effect on connection design, thickness of connection plate. Selection of governing forces for connection design.

Learning Outcomes:

- Identify and describe the types, grades, and mechanical properties of high-strength bolts commonly used in PEB connection design.
- Analyze the influence of lever arm, bolt pattern, and spacing on the strength and behavior of structural connections.
- Determine the required thickness of connection plates and other connecting elements based on load transfer requirements and codal guidelines.

TEXT BOOKS:

1. K. S. Vivek & P. Vaishavi, Pre Engineered Steel Buildings, 2017
2. V. Soundararajan, R. Jagadeesh kumar, S Kalpana Devi, Prefabricated structures, 2013
3. Dr. R. Ganesan and Mrs. A. Latha, Prefabricated Structures, 2014

REFERENCES:

1. K. S. Vivek, P. Vyshnavi, Pre - Engineered Steel Building, Limit State Design of Structural Members
2. Design Concept of Pre Engineered Building by Syed Firoz, Sarath Chandra kumar, S. kanakamba rao International Journal of Engineering Research and Applications, vol2 pp 267-272.

2450142 - ELEMENTS OF EARTHQUAKE ENGINEERING

(Professional Elective – I)

B. Tech. III Year I Sem **L T P C**

Pre-Requisites: Structural Engineering (I&II) **3 0 0 3**

Course Objectives: The objectives of the course are to

1. Understand Engineering Seismology.
2. Explain and discuss single degree of freedom systems subjected to free and forced vibrations.
3. Acquire the knowledge of the conceptual design and principles of earthquake resistant designs as per IS codes.
4. Understand importance of ductile detailing of RC structures.

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

1. Explain and derive fundamental equations in structural dynamics.
2. Discuss and explain causes and Theories on earthquake, seismic waves, measurement of earthquakes.
3. Evaluate base shear using IS methods.
4. Design and Detail the reinforcement for earthquake forces.
5. Identify and evaluate the various requirements and factors affecting ductility in RC members and structural systems.

UNIT - I

Engineering Seismology: Earthquake phenomenon - cause of earth quakes -Faults- Plate tectonics- Seismic waves- Terms associated with earthquakes-Magnitude/Intensity of an earthquake-scales Energy Released- Earthquake measuring instruments seismogram - Seismoscope, Seismograph, strong ground motions- Seismic zones of India. Theory of Vibrations: Elements of a vibratory system- Degrees of Freedom-Continuous System Lumped mass Idealization-Oscillatory motion-Simple Harmonic Motion-Free vibration of single degree of freedom (SDOF) system- undamped and damped-critical damping-Logarithmic decrement- Forced vibrations-Harmonic excitation- Dynamic magnification factor-Excitation by rigid based translation for SDOF system-Earthquake ground motion.

Learning Outcomes:

- Identify and differentiate between earthquake measuring instruments such as

seismoscope, seismograph, and accelerograph, and interpret a basic seismogram.

- Explain the basic elements and behavior of vibratory systems, including degrees of freedom, continuous and lumped-mass idealization.
- Describe the types and characteristics of seismic waves and various terms associated with earthquakes including magnitude, intensity, and energy release.

UNIT - II

Conceptual design: Introduction-Functional Planning-Continuous load path-Overall form- simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical Members-Twisting of buildings- Ductility-definition-ductility relationships-flexible buildings- framing systems-choice of construction materials- unconfined concrete-confined concrete- masonry-reinforcing steel. Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations- basic assumptions-design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method.

Learning Outcomes:

- Discuss the principles of functional planning and continuous load path for ensuring safe load transfer under seismic forces.
- Analyze the influence of building form, symmetry, stiffness, and strength distribution on seismic behavior.

UNIT - III

Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members- Structural models for frame buildings- Seismic methods of analysis- IS code based methods for seismic design- Vertical irregularities- Plan configuration problems- Lateral load resisting systems- Determination of design lateral forces as per IS 1893 (Part-1):2016- Equivalent lateral force procedure- Lateral distribution of base shear.

Learning Outcomes:

- Explain the principles of earthquake-resistant design for reinforced concrete (RC) structural members in buildings.
- Develop suitable structural models for frame-type buildings to represent their dynamic behavior under seismic loads.

UNIT - IV

Masonry Buildings: Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings- Behaviour of unreinforced and reinforced masonry walls- Behaviour of walls- Box action and bands- Behaviour of infill walls- Improving seismic behaviour of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

Learning Outcomes:

- Classify different categories of masonry buildings and understand their structural behavior under seismic forces.
- Explain the elastic properties of masonry assemblages and their relevance in seismic design.
- Evaluate the behavior of walls, box action, bands, and infill walls in response to lateral earthquake loads.

UNIT - V

Ductility: Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920-2016 -Behaviour of beams, columns and joints in RC buildings during earthquakes.

Learning Outcomes:

- Explain the concept of ductility and its importance in earthquake-resistant design of RC buildings.
- Examine the factors affecting ductility, including material properties, member detailing, and structural configuration.

TEXT BOOKS:

1. Earthquake Resistant Design of structures – S. K. Duggal, Oxford University Press
2. Earthquake Resistant Design of structures – Pankaj Agarwal and Manish Shrikhande, Prentice Hall of India Pvt. Ltd.

REFERENCE BOOKS:

1. Seismic Design of Reinforced Concrete and Masonry Building — T. Paulay and M.J.N.

Priestly, John Wiley & Sons.

3. Earthquake Resistant Design of Building structures by Vinod Hosur, Wiley India Pvt. Ltd.
4. Elements of Mechanical Vibration by R.N. Iyengar, I.K. International Publishing House Pvt. Ltd.
6. Masory and Timber structures including earthquake Resistant Design –Anand S.Arya, Nemchand & Bros
7. Earthquake Tips – Learning Earthquake Design and Construction, C.V.R. Murthy BIS

Codes: 1. IS 1893(Part-1):2016. 2. IS 13920:2016. 3. IS 4326. 4. IS 456:200

2450143 - PREFABRICATED STRUCTURES

(Professional Elective – I)

B. Tech. III Year I Sem	**L**	**T**	**P**	**C**
Pre-Requisites: Structural Engineering (I&II)	**3**	**0**	**0**	**3**

Course Objectives: The objective of the course is

1. To understand the importance of Prefabrication
2. To know the process of prefabrication of various structural elements
3. To understand the assembling and dismantling of prefabricated components
4. To study the design considerations in the process of prefabrication
5. To understand the joining techniques in prefabrication

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

1. Know the principle & procedure of prefabrication
2. Design the structural prefabricated elements.
3. Familiarize with joining techniques used for prefabrication
4. Know the manufacturing technology adopted
5. Know abnormal loads which are hazardous to the prefabricated structures.

UNIT - I
GENERAL PRINCIPLES OF FABRICATION

Types of prefabrication – site and plant prefabrication -Economy of prefabrication – Modular coordination — Standardization- Disuniting of Prefabricates, production, transportation, erection, stages of loading – Applications of Prefabrication.

Learning Outcomes:

- Explain the concept of prefabrication and classify the different types such as site and plant prefabrication**.**
- Describe the principles of modular coordination, standardization, and disuniting in prefabricated construction.

UNIT - II
PREFABRICATED COMPONENTS

Behaviour of structural components - Roof and floor panels- wall panels – footings – Joints for different structural Connections – Effective sealing of joints for water proofing- Columns – Shear walls

Learning Outcomes:

- Explain the behavior of various prefabricated structural components under different load conditions.
- Describe and classify roof, floor, and wall panels, including their structural functions and design considerations.

- Analyze the behavior and design of footings, columns, and shear walls in prefabricated systems.

UNIT - III
MANUFACTURING TECHNOLOGY
Manufacturing methods – Stationary and mobile production- Storage of precast elements - Dimensional tolerances
Learning Outcomes:
- Differentiate between stationary and mobile production techniques, highlighting their advantages, limitations, and suitable applications.
- Describe proper storage practices for precast elements to maintain quality, safety, and durability.

UNIT - IV
HOISTING TECHNOLOGY
Equipments for hoisting and erection – Techniques for erection of different types of members like Slabs, Beams, Wall panels and Columns – Advanced techniques - Vacuum lifting pads. **Learning Outcomes:**
- Identify and describe the various equipment and machinery used for hoisting and erection of prefabricated components.
- Explain the techniques for erection of different structural members such as slabs, beams, wall panels, and columns.

UNIT - V
DESIGN FOR ABNORMAL LOADS
Progressive collapse-Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., Importance of avoidance of progressive collapse.
Learning Outcomes:
- Explain the concept of abnormal loads and their significance in structural design, including earthquakes, cyclones, and other extreme events.
- Determine equivalent design loads to account for abnormal or extreme loading conditions as per relevant codes.

TEXT BOOKS:
1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994

REFERENCES:
1. Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
2. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.

2450144 - INTRODUCTION TO OFFSHORE STRUCTURES

(Professional Elective – I)

B. Tech. III Year I Sem	**L**	**T**	**P**	**C**
Pre-Requisites:-	**3**	**0**	**0**	**3**

Course Objectives: The objective of the course is

1. To understand the importance and functions of offshore structure
2. To know the materials used in marine environment
3. To Know the Installation Methods of Offshore Structures

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

1. understand the functions of Offshore Structures
2. know the materials used for marine structures
3. know the different loads on Offshore Structures
4. understand the basic design of Offshore structures
5. know mooring system, industry standards and rules

UNIT - I

Introduction to Offshore Structures - Functions of Offshore Structures - Offshore Structure Configurations - Bottom Supported Fixed Structures - Compliant Structures - Floating Structures.

Learning Outcomes:

- Identify and describe the major functions of offshore structures, including production, drilling, and support activities.
- Explain the concept and purpose of offshore structures and their role in marine and offshore engineering.

UNIT - II

Materials for Marine Environment - Structural Steel Topside Materials - Advanced Composite materials - Corrosion Control Material - Reliability and Monitoring - Fracture Control.

Learning Outcomes:

- Explain the importance of corrosion control and the various techniques used to protect offshore structures.
- Analyze the reliability and monitoring requirements of materials in harsh marine environments to ensure safety and durability.

UNIT - III

Loads on offshore Structures - Gravity Loads, Hydrostatic Loads - Resistance Loads, Current loads on Structures - Current Drag and Lift Force, Steady, Dynamic and Wind Loads on

Structures - Wave Loads on Structures - Varying Wind Load - Impulse loads - Introduction to design.

Learning Outcomes:

- Explain the effects of current drag and lift forces on offshore structural members and their significance in design.
- Describe various steady, dynamic, and wind loads, including wave loads and impulse loads, acting on offshore structures.

UNIT - IV

Mooring - General layout Areas and Equipment - Helideck Platform Crane Mooring systems : Mooring Hardware components

Learning Outcomes:

- Explain the concept and purpose of mooring systems in offshore structures, including general layout considerations.
- Describe the types of mooring systems used for floating and fixed offshore structures.

UNIT - V

Installation Methods of Offshore Structures - Platform Installation Methods: Fixed Platform Substructures - Floating Structures Foundations Subsea Templates.

Learning Outcomes:

- Identify and analyze methods for floating structure installation, including mooring and positioning techniques.
- Explain the use and function of foundations and subsea templates in offshore construction

TEXT BOOKS:

1. Reddy, D.V & Arockiasamy, M., Offshore Structures Vol.1 & 2, Kreiger Publ. Co.1991.
2. Graff, W.J., Introduction to Offshore Structures, Gulf Publ.Co.1981.

REFERENCES:

1. Morgan, N., Marine Technology, Butter worths, 1990.
2. Dawson, T.H., Offshore Structural Engineering, Prentice Hall, 1983.
3. B.C Gerwick, Jr. Construction of Marine and Offshore Structures, CRC Press, Florida, 2000.

2450101 - INTRODUCTION TO CIVIL ENGINEERING
(Open elective- I)

B. Tech. III Year I Sem	**L T P C**
Prerequisites: -	**3 0 0 3**

Course objective:

- Overview of civil engineering and building basics.
- Basics of surveying and building materials.
- Introduction to construction techniques and infrastructure.
- Fundamentals of transportation and traffic engineering.
- Basics of hydrology, environment, and geotechnical engineering.

Course outcome:

- Identify the disciplines of civil engineering and explain the components and planning principles of buildings.
- Describe surveying principles and identify the properties and uses of basic building materials.
- Outline construction methods and explain essential building services.
- Classify transportation systems and summarize basic concepts of highway, railway, airport, and traffic engineering.
- Explain fundamentals of water resources, environmental systems, and describe basics of soil and foundation engineering.

Unit-I

Introduction to Civil Engineering — Various disciplines of Civil engineering, Importance of Civil engineering in infrastructure development of the country. Job prospects of Civil Engineering in various sectors. Introduction to types of buildings as per NBC, Selection of site for buildings, Components of a residential building and their functions, Introduction to Industrial buildings and types.

Learning Outcomes:

At the end of the unit, student should able to

- Understand Concepts of civil engineering, disciplines, buildings, site selection.
- Applying NBC rules, Vaastu principles, building components.

Unit-II

Building Materials – Bricks, properties and specifications, Cement – Types, properties, grades, other types of cement and uses, Cement mortar – Constituents, Preparation, Concrete – PCC and RCC, Grades, Steel – Use of steel in buildings, types.

Learning Outcomes:

At the end of the unit, student should able to

- Perform levelling, prepare level book, compute problems, apply material

specifications.

- Assess suitability of instruments (EDM, GPS, Total station) and materials (cement, concrete, steel) for construction.

Unit-III

Building Construction – Foundations, Classification, Bearing Capacity of Soil and related terms (definition only), Masonry Works – classifications, definition of different technical terms, Brick masonry – types, bonds, general principle, Roofs – functional requirements, basic technical terms, roof covering material, Floors – function, types, flooring materials (brief discussion), Plastering and Painting — objectives, types, preparation and procedure of application.

Basic Infrastructure services – air conditioning & purpose, fire protection & materials, Ventilation, necessity & functional requirements, Lifts, Escalators.

Learning Outcomes:

At the end of the unit, student should able to

- Grasp basic definitions, classifications (foundations, masonry, roofs, floors, plastering, painting, services).
- Apply principles of construction methods, functional requirements, and use of materials.
- Compare suitability of different materials, evaluate construction practices, and analyze service requirements.

Unit-IV

Role of Transportation in National development, Transportation Ways, Surface Transportation and Aviation.

Traffic engineering – traffic characteristics, traffic studies, traffic operations (signals, signs, markings), Urban engineering – classification of urban road.

Learning Outcomes:

At the end of the unit, student should able to

- Understand the role of transportation in national development.
- Identify different modes of transportation, including surface and aviation.
- Explain traffic characteristics and conduct basic traffic studies.

Unit-V

Elementary Hydrology, Sources of water, Watershed Development, Water requirements and its conservation, Basic Introduction of Hydraulic Structures of Storage (Only Dams)

Learning Outcomes:

At the end of the unit, student should able to

- Grasp basic concepts of hydrology, ecosystems, pollution, soil & rock mechanics.
- Apply principles in watershed development, water conservation, treatment systems, and foundation selection.

Text Books:

- Basic Civil engineering, Gopi, S., Pearson Publication
- Basic Civil Engineering, Dr. B.C. Punima, Ashok Kumar Jain, Arun Kr. Jain, Laxmi Publications

- Basic Civil Engineering, S.S. Bhavikatti, New Age International Publishers

Reference Books:

- Construction Technology, Chudley, R., Longman Group, England
- Basic Civil and Environmental Engineering, C.P. Kausik, New Age.
- American Society of Civil Engineers (2011) ASCE Code of Ethics – Principles Study and Application

2450102 - ENERGY FROM WASTE
(Open Elective – I)

B.Tech. III Year I Sem **L T P C**

Prerequisites: - **3 0 0 3**

Course objective:

- To introduce students to the different types of waste and their characterization.
- To teach students the various methods of converting waste to energy.
- To develop students' understanding of the principles behind the conversion processes.
- To equip students with the knowledge and skills to design and implement waste- to-energy projects.

Course outcome:

- Student will be able to characterize different types of waste and understand the principles behind waste-to-energy conversion processes.
- Analyze the suitability of different waste-to-energy conversion methods for specific waste types.
- Design and implement waste-to-energy projects
- Apply the principles to select suitable energy recovery methods for given waste conditions
- Apply practical experience in waste-to-energy conversion techniques.

Unit I

Wastes: Introduction and characterization of wastes, definition of waste, types of waste, characteristics of waste, waste disposal methods.

Learning Outcomes:

At the end of this unit, the student will be able to

- Recall waste definitions, types, and characteristics.
- Explain how waste is classified and why characterization is important.
- Apply appropriate waste disposal methods to real-world situations.

Unit II

Energy Production from Wastes — I: Energy production through incineration, gasification, pyrolysis and syngas utilization. Incineration: principle, advantages, and disadvantages; Gasification: principle, advantages, and disadvantages; Pyrolysis: principle, advantages, and disadvantages; Syngas utilization: principle, advantages, and disadvantages.

Learning Outcomes:

At the end of this unit, the student will be able to

- Break down and compare different waste-to-energy technologies.
- Judge advantages and disadvantages of each method (incineration, gasification, pyrolysis, syngas).
- Apply the principles to select suitable energy recovery methods for given waste conditions.

Unit III

Energy Production from Wastes – II: Energy production through anaerobic digestion, fermentation, transesterification and introduction to microbial fuel cells. Anaerobic digestion: principle, advantages,

and disadvantages; Fermentation: principle, advantages, and disadvantages; Transesterification: principle, advantages, and disadvantages; Introduction to microbial fuel cells: principle, advantages, and disadvantages.

Learning Outcomes:

At the end of this unit, the student will be able to

- Grasp the principles of anaerobic digestion, fermentation, transesterification, and microbial fuel cells.
- Evaluate and differentiate advantages & disadvantages of the processes.
- Explore new applications of microbial fuel cells and bio-based energy production.

Unit IV

Energy Production from Algae: Cultivation of algal biomass from wastewater and energy production from algae. Algae cultivation: principle, advantages, and disadvantages; Energy production from algae: principle, advantages, and disadvantages; Applications of algae in waste management.

Learning Outcomes:

At the end of this unit, the student will be able to

- Students will learn the principles of algal growth using wastewater.
- They will understand energy conversion pathways from algal biomass.
- They will appreciate algae's role in waste management & eco-friendly energy.

Unit V

Energy Production from Solid Wastes: Densification of solids, efficiency improvement of power plant and energy production from waste plastics. Densification of solids: principle, advantages, and disadvantages; Efficiency improvement of power plants: principle, advantages, and disadvantages; Energy production from waste plastics: principle, advantages, and disadvantages; Applications of waste plastics in energy generation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Students understand densification of solids and efficiency improvements in power plants.
- They learn principles of energy recovery from waste plastics.
- They explore novel applications of plastics in sustainable energy generation.

TEXT BOOKS:

- Energy Recovery from Municipal Solid Waste by Thermal Conversion Technologies —– P. Jayaraman Reddy (2016)
- Material and Energy Recovery from Solid Waste for a Circular Economy — Atun Roy Choudhury & Sankar Ganesh Palani (2024)
- Energy Recovery Processes from Wastes — Sadhan Kumar Ghosh

Reference Books:

- Rogoff, M. J. and Screve, F., "Waste-to-Energy: Technologies and Project Implementation",

Elsevier Store, 2011.

- Young G. C., "Municipal Solid Waste to Energy Conversion processes", John Wiley and

2450181 - CONCRETE TECHNOLOGY LABORATORY

B. Tech. III Year I Sem **L T P C**

Prerequisites: Building Materials, Construction and Planning **0 0 2 1**

Course Objectives: The objective of the course is

1. To know different types of cement as per their properties for different field applications.
2. To understand Design economic concrete mix proportion for different exposure conditions and intended purposes.
3. To know field and laboratory tests on concrete in plastic and hardened stage.
4. To understand the different properties of materials and different types of procedures adopted for mix design
5. To summarize the concept of workability and testing of hardened concrete.

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

1. Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests.
2. Recognize the effects of the rheology and early age properties of concrete on its long- term behaviour.
3. Apply the use of various chemical admixtures and mineral additives to design cement based materials with tailor-made properties
4. Use advanced laboratory techniques to characterize cement-based materials.
5. Perform mix design for a given set of conditions.

I. TEST ON CEMENT

1. Normal Consistency and fineness of cement.
2. Initial setting time and final setting time of cement.
3. Specific gravity of cement
4. Soundness of cement.
5. Compressive strength of cement.

II. TEST ON AGGREGATE

1. Sieve Analysis and gradation zone
2. Bulking of sand.
3. Bulk and compact densities of fine and coarse aggregates

III. TEST ON FRESH CONCRETE

1. Slump test
2. Compaction factor test

3. Vee-bee Test
4. Flow table Test.

Self-Compacting Concrete

1. Slump cone
2. V funnel
3. L Box

IV. TEST ON HARDENED CONCRETE

1. Compression test on cubes & cylinders
2. Flexure test
3. Splitting Tensile Test
4. Modulus of Elasticity

V. NON DESTRUCTIVE TEST OF CONCRETE

1. Rebound hammer
2. Ultrasound pulse Velocity (UPV).

TEXT BOOKS:

1. Concrete Technology by M.S. Shetty – S. Chand & Co.
2. Concrete Manual by M.L. Gambhir, Dhanpat Rai & Sons.

2450182 – STRUCTURAL ANALYSIS LABORATORY

B.Tech. III Year I Sem **L T P C**

Prerequisites: Computer Aided Civil Engineering Drawing or **0 0 2 1**

Auto CAD Principles –Excel- Structural Engineering -1 & 2

Course Objectives: The objectives of the course are to

1. Understand and apply fundamental concepts of structural analysis for beams, trusses, frames, and grid structures.
2. Experimentally determine internal forces, bending moments, shear forces, and deflections in structural members.
3. Develop proficiency in the use of modern structural analysis software, such as STAAD Pro, for 2D and 3D structural modeling and analysis.
4. Compare theoretical, numerical, and experimental results to validate analysis methods.
5. Interpret results for design considerations and understand the behavior of indeterminate and determinate structures under various loading conditions.

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

1. Model beams, trusses, frames, and grids using structural analysis software.
2. Analyze determinate and indeterminate structures to determine bending moments, shear forces, and deflections.
3. Conduct experiments on physical models to measure reactions, deflections, and internal forces.
4. Compare and validate experimental results with theoretical calculations and software predictions.
5. Visualize stress distribution, deformations, and mode shapes in structural members using software tools.

LIST OF EXPERIMENTS

1. Beam Analysis
   - Simply Supported Beam under Point Load and UDL
   - Cantilever Beam Analysis
   - Overhanging and Continuous Beams
2. Truss Analysis
   - Plane Truss Analysis
   - Space Truss Analysis
3. Frame Analysis
   - Single-Storey Portal Frame
   - Multi-Storey Frame
   - Eccentrically Loaded Frame
4. Dynamic Analysis

- Modal Analysis of a Frame
- Seismic Analysis

Note: Drafting of all the exercises is to be carried out using commercially available designing software's

2450183 – SOIL MECHANICS LABORATORY

	L	T	P	C
B. Tech. III Year I Sem				
Pre-Requisites: Geotechnical Engineering	**0**	**0**	**2**	1

Course Objectives: The objective of the course is

To obtain index and engineering properties of locally available soils, and to understand the behaviour of these soil under various loads.

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

1. Classify and evaluate the behaviour of the soils subjected to various loads.
2. determine the atterberg limits
3. determine specific gravity of soil
4. evaluate permeability of soil
5. determine coefficient of consolidation

LIST OF EXPERIMENTS:

1. Atterberg Limits (Liquid Limit, Plastic Limit, and Shrinkage limit)
2. a) Field density by core cutter method and
   b) Field density by sand replacement method
3. Determination of Specific gravity of soil Grain size distribution by sieve analysis
4. Permeability of soil by constant and variable head test methods
5. Standard Proctor's Compaction Test
6. Determination of Coefficient of consolidation (square root time fitting method)
7. Unconfined compression test
8. Direct shear test
9. Vane shear test
10. Differential free swell index (DFSI) test

REFERENCE:

1. Measurement of Engineering Properties of Soils by. E. Saibaba Reddy & K. Rama Sastri, New Age International

2450022 - GENDER SENSITIZATION

B.Tech. III Year I Sem **L P T C**

0 0 0 0

Course Objectives:

1. To develop students' sensibility with regard to issues of gender in contemporary India.
2. To provide a critical perspective on the socialization of men and women.
3. To introduce students to information about some key biological aspects of genders.
4. To expose the students to debates on the politics and economics of work.
5. To help students reflect critically on gender violence.
6. To expose students to more egalitarian interactions between men and women.

Course Outcomes:

1. Students will have developed a better understanding of important issues related to gender in contemporary India.
2. Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
3. Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
4. Students will acquire insight into the gendered division of labour and its relation to politics and economics.
5. Men and women students and professionals will be better equipped to work and live together as equals.

UNIT - I: UNDERSTANDING GENDER

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

Learning Outcomes:

- Define key concepts and terminology related to gender studies, including sex, gender, and gender roles.
- Explain the process of socialization and how it shapes the construction of gender in society.

UNIT – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender

Roles- Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

Learning Outcomes:

- Explain the concept of gender roles and relations, including types and variations in societal contexts.
- Analyze the impact of discrimination and societal norms on gender roles and relationships.

UNIT – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work.

Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

Learning Outcomes:

- Analyze the concept of invisible and unrecognized work, including household labour and care work.
- Evaluate statements like "My Mother Doesn't Work" and campaigns such as "Share the Load" to understand social perceptions of labour.

UNIT – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve- teasing- Coping with Everyday Harassment- Further Reading: "Chupulu".

Domestic Violence: Speaking Out Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life" **Learning Outcomes:**

- Explain gender-based violence from a human rights perspective, including legal and social frameworks.
- Analyze forms of sexual harassment and domestic violence, distinguishing them from socially normalized behaviors like "eve-teasing."
- Evaluate coping strategies and societal responses to gender-based violence, drawing insights from case studies and media such as "Chupulu" and "I Fought for my Life."

UNIT – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language- Gender and Popular Literature - Just Relationships: Being Together as Equals

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Learning Outcomes:

- Evaluate the importance of gender-sensitive language and communication in media and literature
- Analyze how cultural representations reinforce or challenge gender norms and stereotypes.

III-II

2460131 – DESIGN OF STEEL STRUCTURES AND DRAWING

B. Tech. III Year II Sem **L T P C**

Prerequisites: Structural Engineering -1 (RCC) **3 1 0 4**

Course Objectives: The objective of the course is

1. To learn about the basics of steel sections and their prominence in constructions.
2. To impart knowledge on different types of connections
3. To learn about the design of beams.
4. To learn about design of tension and compression member.
5. To learn about design of roof truss and purlin.

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

1. To design bolted and welded connections
2. To design laterally supported and unsupported beams.
3. To design tension member.
4. To design compression member
5. To design roof trusses and purlin.

UNIT - I

Introduction: Introduction to steel structures, merits and demerits

Bolted and Riveted Connections: Introduction, advantages and disadvantages of bolting and riveting, General terminology, Strength of bolts and rivets, bearing stress and shear stress, Permissible limits, IS Code requirements.

Welded Connections: Introduction, advantages and disadvantages of welding, Strength of welds, Butt and fillet weld; Permissible stresses, IS Code requirements. Design of fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints. **Learning Outcomes:**

At the end of the unit, students will be able to understand,

- Basics of steel, its properties, merits and demerits.
- Design of bolted and welded connections.

UNIT - II

Laterally Supported Beams: Design of simple and compound beams, Curtailment of flange plates.

Laterally Unsupported Beams: Design of laterally unsupported beams.

Plate Girder: Design of plate girder

Learning Outcomes:

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

- Design of laterally supported beams.
- Design of laterally unsupported beams.

UNIT - III

Tension Members: General Design of members subjected to direct tension and bending, effective length of columns; Slenderness ratio, permissible stresses.

Compression Members: Design of axially loaded compression members, struts; eccentrically loaded columns; Splicing of members using bolting.

Learning Outcomes:

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

- Design of tension member.
- Design of compression member.

UNIT - IV

Design of Lacings: Design principles as per IS Code. Design of single and double lacing system using bolting for channel and angle sections.

Design of Battens: Design principles and specifications as per IS Code. Design of batten systems using bolting for channel and angle sections.

Learning Outcomes:

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

- Design of Lacing.
- Design of Battens.

UNIT - V

Roof Truss: Types of Trusses, Loads on trusses, Design of roof trusses

Purlin: Design of purlin

Learning Outcomes:

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

- Design of roof trusses.
- Design of purlins.

TEXT BOOKS:

1. Duggal. S.K, "Limit State Design of Steel Structures", Tata McGraw Hill Publishing Company, 2005.
2. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS: 800, 2007, IK International Publishing House Pvt. Ltd., 2009.
3. Subramanian.N, "Design of Steel Structures", Oxford University Press, New Delhi, 2013.

REFERENCES:

1. Gambhir. M.L., "Fundamentals of Structural Steel Design", McGraw Hill Education India Pvt. Ltd., 2013
2. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd,

Learning Pvt. Ltd., 2nd Edition, 2013.

3. Narayanan.R.et.al. "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002.
4. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800,2007 Structures Publications, 2009.
5. IS 800:2007, General Construction In Steel, Code of Practice, (Third Revision), Bureau of Indian Standards, New Delhi, 2007

CODES/TABLES:

IS: CODES-STEEL TABLES:

1. IS -800, 2007
2. IS - 875, Part III
3. Steel Tables.
4. IS 1367 (PART 3)

2460132 – ENVIRONMENTAL ENGINEERING

B.Tech. III Year II Sem **L T P C**

Prerequisites: Environmental Science **3 0 0 3**

Course Objectives: The objective of the course is

1. This subject provides the knowledge of water sources, water treatment, design of distribution system, waste water treatment, and safe disposal methods.
2. The topics of characteristics of waste water, sludge digestion are also included.

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

1. Assess characteristics of water and wastewater and their impacts
2. Understand layout and application of water treatment units.
3. Estimate quantities of water and waste water and plan conveyance components
4. Examine sewage and disposal of sewage.
5. Design components of water and waste water treatment plants

UNIT – I

Introduction: Waterborne diseases – protected water supply – Population forecasts, design period – types of water demand – factors affecting – fluctuations – fire demand – water quality and testing – drinking water standards: sources of water - Comparison from quality and quantity and other considerations – intakes – infiltration galleries.

Learning Outcomes:

- Explain the importance of protected water supply and identify common waterborne diseases.
- Classify different types of water demand, including domestic, industrial, and fire demand, and factors affecting water consumption.

UNIT – II

Layout and general outline of water treatment units – sedimentation – principles – design factors — coagulation-flocculation clarifier design — coagulants - feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation - comparison of filters – disinfection – theory of chlorination, chlorine demand - other disinfection practices–Design of distribution systems–pipe appurtenances.

Learning Outcomes:

- Explain the layout and general outline of water treatment units, including sedimentation, filtration, and disinfection.
- Analyze the principles of sedimentation, including design factors, coagulation, flocculation, and clarifier design.
- Explain the theory of chlorination, chlorine demand, and other disinfection practices to ensure safe drinking water.

UNIT - III

characteristics of sewage –waste water collection–Estimation of waste water and storm water – decomposition of sewage, examination of sewage – B.O.D. Equation – C.O.D. Design of sewers – shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses – house drainage – plumbing requirements – sanitary fittings-traps – one pipe and two pipe systems of plumbing – ultimate disposal of sewage – sewage farming –self-purification of rivers.

Learning Outcomes:

- Estimate wastewater and storm water quantities based on population, water consumption, and other factors.
- Describe and analyze the decomposition of sewage, including B.O.D., C.O.D., and examination techniques.
- Design sewer systems, considering shapes, materials, and sewer appurtenances such as manholes, inverted siphons, catch basins, and flushing tanks.

UNIT – IV

Waste water treatment plant – Flow diagram - primary treatment Design of screens – grit chambers –skimming tanks – sedimentation tanks – principles of design – Biological treatment – trickling filters –ASP– Construction and design of oxidation ponds. Sludge digestion – factors effecting — design of Digestion tank — Sludge disposal by drying — septic tanks working principles and design – soak pits.

Learning Outcomes:

- Design and evaluate primary treatment units, including screens, grit chambers, skimming tanks, and sedimentation tanks based on relevant principles.
- Describe and analyze biological treatment processes, such as trickling filters, activated sludge process (ASP), and oxidation ponds.
- Explain and evaluate methods for sludge disposal, including drying beds and septic tanks with soak pits.

UNIT – V

Air pollution– classification of air pollution– Effects air pollution–Global effects–Meteorological parameters affecting air pollution–Atmospheric stability–Plume behavior –Control of

particulates –Gravity settlers, cyclone filters, ESPs–Control of gaseous pollutants–automobile pollution and control.

Learning Outcomes:

- Explain the effects of air pollution, including local, regional, and global impacts on health and environment.
- Analyze the influence of meteorological parameters and atmospheric stability on pollutant dispersion and plume behavior.
- Describe and evaluate methods for particulate control, including gravity settlers, cyclone separators, and electrostatic precipitators (ESPs).

TEXT BOOKS:

1. Environmental Engineering, I and II by SK Garg, Khanna Publications.
2. Environmental Engineering by H. S Peavy, D. R. Rowe, G. Tchobanoglous, McGraw Hill Education (India) Pvt Ltd, 2014.
3. Environmental Engineering by D. P. Sincero and G.A Sincero, Pearson 2015.
4. Environmental Engineering, I and II by BC Punmia, Std. Publications.
5. Environmental Pollution and Control Engineering CS Rao,Wiley Publications.

REFERENCES:

1. Water and Waste Water Technology by Steel, Wiley
2. Waste water engineering by Metcalf and Eddy, McGraw Hill, 2015.
3. Water and Waste Water Engineering by Fair Geyer and Okun, Wiley, 2011
4. Water and Waste Water Technology by Mark J Hammar and Mark J. Hammar Jr.Wiley, 2007.
5. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
6. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
7. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication.

2460133 – TRANSPORTATION ENGINEERING

B. Tech. III Year II Sem **L T P C**

Pre-requisites:- **3 1 0 4**

Course Objectives: The objective of the course is

1. To understand the highway planning process and carry out surveys involved in planning and highway alignment.
2. To remember various geometric elements involved in design of highways and expressway.
3. To understand the various traffic studies and to implement traffic regulation and control measures
4. To understand the engineering properties of pavement materials used in highway construction.

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

1. Understand highway planning, development and geometric design
2. Determine the traffic volume and design of traffic signals
3. Design highway geometrics.
4. Design intersections and prepare traffic management plans
5. characterization of Highway material and maintenance

UNIT – I

HIGHWAY DEVELOPMENT, PLANNING AND GEOMETRIC DESIGN

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; Highway Project.

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.

Learning Outcomes:

- The road development plans that initiated for the development of transportation conveniences.
- The design concepts of horizontal alignments.
- The design concepts of vertical alignments.
- Various factors affecting the road network pattern design concepts.

UNIT – II
TRAFFIC ENGINEERING & REGULATIONS

Basic Parameters of Traffic-Volume, Speed and Density - Traffic Volume Studies - Data Collection and Presentation - Speed studies - Data Collection and Presentation - Origin & Destination studies, Parking Studies — On street & Off street Parking - Road Accidents - Causes and Preventive Measures - Accident Data Recording — Condition Diagram and Collision Diagrams - Traffic Signs — Types and Specifications — Road Markings - Need for Road Markings-Types of Road Markings - Design of Traffic Signals — Webster Method.

Learning Outcomes:

- The concept of traffic parameters and characteristics
- The concept of parking studies and accident studies
- Design concepts of traffic signals.
- The knowledge of traffic rules and regulations, signs, markings.

UNIT – III
INTERSECTION
DESIGN

Types of Intersections; Conflicts at Intersections; Requirements of At-Grade Intersections; Types of At-Grade Intersections: Channelized and Channelized Intersections; Traffic Islands; Types of Grade Separated Intersections - Rotary Intersection; Concept of Rotary; Design Factors of Rotary; Advantages and Limitations of Rotary Intersections.

Learning Outcomes:

- The classification of intersections.
- Differentiation of Channelized Intersections and Unchannelized Intersections
- Design concepts of rotary intersections.

UNIT – IV
HIGHWAY MATERIALS, CONSTRUCTION AND MAINTENANCE

Highway material characterization; Subgrade; stone aggregates; bitumen materials; Construction of gravel roads; Construction water Bound macadam roads; Construction of bituminous pavements; Construction of cement concrete roads; Construction of joints in cement concrete pavements; Joint filler and seals; Pavement failures; Highway maintenance.

Learning Outcomes:

- The quality requirements of highway materials like coarse and fine aggregates
- The quality analysis of bitumen.
- The construction methods of different kinds of roads and their constructional requirements.
- The reasons of pavement failures and
- Methods of highway maintenance and drainage systems.

UNIT-V INTELLIGENT TRANSPORT SYSTEMS

ITS user services; Public transportation operations; ITS architecture; ITS planning and evaluation-Standards and their needs; Vehicle to vehicle communications; Vehicle to infrastructure communication.

Learning Outcomes:

- The concepts of ITS.
- The planning concept of ITS
- Communications systems of ITS.

TEXT BOOKS:

1. Highway Engineering – S. K. Khanna, C. E. G. Justo, A. Veeraragavan, Nemchand & Bros., 10th edition, 2018.
2. Traffic Engineering & Transportation Planning – Dr. L. Kadyali, Khanna Publications – 6th Edition, 1997.

REFERENCES:

1. Principles of Traffic and Highway Engineering – Garber & Hoel, Cengage Learning.
2. Principles and Practices of Highway Engineering – Dr. L. R. Kadiyali and Dr. N. B Lal - Khanna Publications.
3. Highway Engineering – S. P. Bindra , Dhanpat Rai & Sons. – 4th Edition (1981)
4. IRC 37-2012 : Tentative guidelines for design of flexible pavement
5. IRC 58-2011: Guidelines for design of plain jointed rigid pavements.

IRC 81-1997 : Guidelines for design of overlay using Benkalman Beam Deflection Technique

2460145: INDETERMINATE STRUCTURAL ANALYSIS

(Professional Elective – II)

B.Tech. III Year II Sem. **L T P C**

3 0 0 3

Course Objectives: The objectives of the course are to

1. Understand the matrix method of analysis statically indeterminate frames and trusses.
2. Know the transformation of coordinates and assembly of stiffness matrices
3. Differentiate between flexibility and stiffness methods of analysis of beams, frames and plane trusses
4. Understand the structural behavior of large frames with or without shear walls

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

1. Analyze the multistory building frames by various approximate methods.
2. Solve the continuous beams, portal frames by matrix methods of analysis.
3. Analyze and design of large frames with or without shear walls
4. Apply classical methods such as force method and displacement method for analyzing indeterminate beams, frames, and trusses.
5. Determine member forces and deformations in indeterminate structures under various types of loading, including moving and temperature loads.

UNIT- I

Introduction to matrix methods of analysis statically indeterminacy and kinematics indeterminacy- degree of freedom-coordinate system-structure idealization stiffness and flexibility matrices-suitability element stiffness equations – elements flexibility equations – mixed force –displacement equations — for truss element, beam element and tensional element Transformation of coordinates-element stiffness matrix-and load vector-local and global coordinates.

Learning outcomes:

- Explain the concepts of static and kinematic indeterminacy and their significance in structural analysis
- Develop stiffness and flexibility matrices for structural elements and determine their suitability for specific analysis problems.

UNIT- II

Assembly of stiffness matrix from element stiffness matrix-direct stiffness method- general procedure- bank matrix-semi band width-computer algorithm for assembly by direct stiffness matrix method.

Learning outcomes:

- Apply the concept of band matrix and semi-bandwidth to optimize storage and computation in matrix assembly.
- Analyze structural systems by assembling and solving global stiffness equations for beams, trusses, and frames.

UNIT- III

Analysis of plane truss-continuous beam-plane frame and grids by Flexible methods.

Learning outcomes:

- Analyze plane trusses using the flexibility method to determine member forces and reactions
- Perform analysis of continuous beams and plane frames under various loading conditions using the flexibility method

UNIT- IV

Analysis of plane truss-continuous beam-plane frame and grids by stiffness methods.

Learning outcomes:

- Assemble element and global stiffness matrices for plane trusses, beams, frames, and grid structures**.**
- Analyze plane trusses to determine member forces and joint displacements using stiffness matrices

UNIT- V

Special analysis procedures-static condensation and sub structuring-initial and thermal stresses. Shear Walls Necessity-structural behavior of large frames with and without shear walls-approximate methods of analysis of shear walls.

Learning outcomes:

- Analyze initial and thermal stresses in indeterminate structures and understand their impact on design.
- Apply approximate methods of analysis to evaluate the response of frames with and without shear walls.

TEXT BOOKS:

1. Matrix methods of structural analysis by Willam Weaver and gere, CBS Publishers.
2. Advanced Structural Analysis by A.K. Jain Nemch and Publishers

REFERENCES:

1. Advanced Structural Analysis by Devdas Menon, Narosa publishing house.
2. Matrix methods of structural analysis by Pandit and gupta
3. Matrix methods of structural analysis by J Meek
4. Structural Analysis by Ghali and Neyveli

2460146 – PRESTRESSED CONCRETE

(Professional Elective – II)

B.Tech. III Year II Sem **L T P C**

Prerequisites: Reinforced Concrete Design **3 0 0 3**

Course Objectives: The objectives of the course are to

1. Understand the principles & necessity of prestressed concrete structures.
2. Know different techniques of prestressing.
3. Get the knowledge on various losses of prestress.
4. Understand Analysis and design of prestressed concrete members.

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

1. Understand principles of prestressing
2. Know the method and system of prestressing and evaluate losses of prestressing
3. Analysis of section for flexure
4. Analysis of section for shear
5. Analysis of composite beam and deflection

UNIT - I

Introduction: Historic development- General principles of pre-stressing pre-tensioning and post tensioning- Advantages and limitations of Prestressed concrete- General principles of PSC Classification and types of prestressing- Materials- high strength concrete and high tensile steel their characteristics - Flexural analysis of prestressed concrete beam including load balancing concept.

Learning outcomes:

- Describe the general principles of pre-tensioning and post-tensioning, including methods of applying pre stress.
- Evaluate the advantages and limitations of pre stressed concrete compared to conventional reinforced concrete.

UNIT - II

Methods and Systems of pre-stressing: Pre-tensioning and Posttensioning methods and systems of prestressing like Hoyer system, Magnel Blaton system, Freyssinet system and Gifford- Udall System- Lee McCall system.

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 stress in steel, slip in anchorage, frictional losses.

Learning outcomes:

- Explain the pre-tensioning and post-tensioning methods used in pre stressed concrete construction.
- Identify the different losses of pre stress in pre-tensioned and post-tensioned members due to factors like elastic shortening, shrinkage, creep, relaxation, anchorage slip, and friction.
- Analyze the effect of pre stress losses on member performance and structural behavior

UNIT – III

Flexure: Analysis of sections for flexure- beams prestressed with straight, concentric, eccentric, bent and parabolic tendons- stress diagrams- Elastic design of PSC slabs and beams of rectangular and I sections- Kern line — Cable profile and cable layout.

Shear: General Considerations- Principal tension and compression- Improving shear resistance of concrete by horizontal and vertical prestressing and by using inclined or parabolic cables- Analysis of rectangular and I beams for shear — Design of shear reinforcements- IS Code provisions**.**

Learning outcomes:

- Explain the concept of kern line, cable profile, and layout in PSC members.
- Design PSC slabs and beams of rectangular and I-sections using elastic theory.
- Interpret stress distribution and draw stress diagrams for various tendon profiles.

UNIT - IV

Transfer of Prestress in Pretensioned Members: Transmission of prestressing force by bond – Transmission length – Flexural bond stresses – IS code provisions – Anchorage zone stresses in post tensioned members – stress distribution in End block – Analysis by Guyon, Magnel, Zienlinski and Rowe's methods – Anchorage zone reinforcement- IS Provisions

Learning outcomes:

- Determine the transmission length and flexural bond **stresses** in pre stressed concrete.
- Describe the anchorage zone stresses in post-tensioned members and their stress distribution.
- Design suitable anchorage zone reinforcement as per IS code guidelines.

UNIT - V

Composite Beams: Different Types- Propped and Unpropped- stress distribution- Differential shrinkage- Analysis of composite beams- General design considerations.

Deflections: Importance of control of deflections- Factors influencing deflections – Short term deflections of uncracked beams- prediction of long time deflections- IS code requirements.

Learning outcomes:

- Identify the types of composite beams such as propped and unpropped sections
- Explain the **stress** distribution and effects of differential shrinkage in composite members
- Explain the importance of deflection control in pre stressed concrete structures.

TEXT BOOKS:

1. Prestressed concrete by Krishna Raju, Tata Mc Graw Hill Book — Co. 6th Edition, New Delhi, 2018
2. Prestressed concrete by K.U.Muthu, Azmi Ibrahim, Maganti Janardhana, M.Vijayanand, PHI Learning Pvt.Ltd, Delhi, 2016.

REFERENCES:

1. Design of prestress concrete structures by T.Y. Lin and Burn, John Wiley, 3rd Edition, New York, 2010.
2. Prestressed concrete by S. Ramamrutham, Dhanpat Rai & Sons, 5th Edition, Delhi, 2013.
3. Prestressed Concrete by N. Rajagopalan, Narosa Publishing House, 2nd Edition, 2017.
4. IS:1343-2012, Prestressed concrete – Code of practice, BIS, New Delhi.

2460147 – ADVANCED STRUCTURAL DESIGN

(Professional Elective – II)

B.Tech. III Year II Sem **L T P C**

Prerequisites: Structural Engineering I & II, Structural Analysis **3 0 0 3**

Course Objective: To make the student more conversant with the design principles of critical structures using limit state approach

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

1. Enhance the capabilities to design the special structural elements as per Indian standard code of practice.
2. Design and Detailing of cantilever type of Retaining walls
3. Design of Flat slabs and Ribbed slabs
4. Design of RCC Circular water tank
5. Design of steel gantry girder.

UNIT – I

Design and Detailing of cantilever type of Retaining walls — Stability Check. Principles & Design of Counterfort Retaining walls.

Learning outcomes:

- Explain the principles of design for cantilever and counterfort retaining walls.
- Design cantilever type retaining walls considering earth pressure and stability requirements.
- Apply the design principles of counterfort retaining walls for economical construction.

UNIT – II

Flat slabs: 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

Ribbed slabs: Analysis of the Slabs for Moment and Shears, Ultimate Moment of Resistance, Design for shear, Deflection, Arrangement of Reinforcements.

Learning outcomes:

- Distribute moments between column strips and middle strips in flat slabs.
- Analyze moment and shear transfer between slab and column connections.
- Check flat slabs for one-way and two-way shear as per IS code provisions.

UNIT – III

Design of RCC Circular Water Tanks resting on ground — Flexible, Rigid and Hinged base water tanks

Learning outcomes:

- Differentiate between flexible, rigid, and hinged base circular water tanks.
- Explain the behavior of circular tanks under hydrostatic pressure.

UNIT – IV

Design of strip and raft RC foundation

Learning outcomes:

- Explain the purpose and types of strip and raft foundations in RCC structures.
- Analyze soil pressure distribution and load transfer mechanisms in strip and raft foundations.
- Design RC strip footings for uniform and non-uniform soil pressures.

UNIT – V

Introduction to Gantry Girders - Design Principles - Design of Steel Gantry Girders.

Learning outcomes:

- Explain the function and components of a gantry girder system.
- Understand the design principles governing gantry girders subjected to moving loads and impact.
- Analyze bending moments, shear forces, and lateral loads on gantry girders.

TEXT BOOKS:

1. Advanced RCC by N. Krishna Raju, CBS Publishers & distributors, New Delhi.
2. Advanced RCC by P.C. Varghese, PHI Publications, New Delhi.
3. Reinforced concrete design by S. Unnikrishna Pillai and Devdas Menon, 4th Edition, Tata Mc Graw Hill.
4. Design Reinforced Concrete Structures by N. Subramanian, 1st Edition, Oxford University Press, 2014.

REFERENCES:

1. RCC Designs by Sushil Kumar, Standard publishing house.
2. Fundamentals of RCC by N.C. Sinha and S.K. Roy, S.Chand Publications, New Delhi.
3. Structural Design and drawing (RCC and steel) by N.Krishna Raju, Univ. Press, New Delhi

4. R.C.C Structures by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Laxmi Publications,
New Delhi.
5. Design of Steel Structures by S.K.Duggal, 3rd Edition, Tata Mc Graw Hill, 2017.

2460148 – INTRODUCTION TO FINITE ELEMENT METHODS

(Professional Elective – II)

B. Tech. III Year II Sem **L T P C**

Prerequisites: Structural Analysis I & II **3 0 0 3**

Course Objectives:

1. To equip the students with the finite element analysis fundamentals.
2. To enable the students to formulate the design problems into FEA.
3. To introduce basic aspects of finite elements technology, including domain discretization, polynomial interpolation, application of boundary conditions, assembly of global arrays, ad solution of the resulting algebraic systems.

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

1. Develop shape functions and stiffness matrices for bar and beam elements
2. To understand iso parametric formulation, static condensation etc.
3. Analyze continuous beam by stiffness matrix approach
4. Formulate CST and LST element
5. Identify mathematical model for solution of common engineering problems.

UNIT – I

Introduction to Finite Element Method – Basic Equations in Elasticity Stress – Strain equation – concept of plane stress – plane strain advantages and disadvantages of FEM. Element shapes – nodes – nodal degree of freedom Displacement function – Natural Coordinates – strain displacement relations.

Learning outcomes:

- Explain the basic concept and need for the Finite Element Method in structural analysis.
- Describe the fundamental equations of elasticity, including stress–strain relationships.

UNIT – II

Lagrangian – Serendipity elements – Hermite polynomials – regular, Irregular 2 D & 3D – Element –shape functions up to quadratic formulation.

Finite Element Analysis (FEA) of – one dimensional problems – Bar element – Shape functions stiffness matrix – stress – strain relation

Learning outcomes:

- Differentiate between Lagrangian, Serendipity, and Hermite elements.
- Develop shape functions for regular and irregular 2D and 3D elements up to quadratic order.
- Formulate the stiffness matrix for a 1D bar element using shape functions.

UNIT – III

FEA Beam elements – stiffness matrix - shape function– Analysis of continuous beams.

Learning outcomes:

- Explain the concept of beam elements in finite element analysis.
- Develop the stiffness matrix for beam elements using appropriate shape functions.
- Analyze continuous beams for bending, shear, and deflection using FEA.

UNIT – IV

FEA Two dimensional problem – CST – LST element – shape function – stress – strain. Iso parametric formulation – Concepts of, iso parametric elements for 2D analysis - formulation of CST element.

Learning outcomes:

- Explain 2D finite element problems under plane stress and plane strain conditions.
- Differentiate between CST (Constant Strain Triangle) and LST (Linear Strain Triangle) elements.

UNIT - V

Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

Learning outcomes:

- Explain the concept and need for numerical integration in finite element analysis.
- Apply static condensation to reduce degrees of freedom in element matrices.

TEXT BOOK:

1. A first course in Finite Element Method by Daryl L. Logan, 5th Edition, Cengage Learning India Pvt. Ltd.
2. Introduction to finite Elements in Engineering by Tirupathi R. Chandrupatla, and Ashok D. Belegundu, Prentice Hall of India

REFERENCES:

1. Finite Element Analysis by P. Seshu, PHI Learning Private Limited
2. Concepts and applications of Finite Element Analysis by Robert D. Cook *et al.*, Wiley India Pvt. Ltd.
3. Applied Finite Element Analysis by G. Ramamurty, I. K. International Publishing House Pvt. Ltd.

2460103 - AIR AND NOISE POLLUTION CONTROL
(Open Elective – II)

B. Tech. III Year II Sem **L T P C**

Prerequisites: **3 0 0 3**

Course Objectives:

To impart knowledge on the sources, effects and control techniques of air pollutants and noise pollution.

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

1. Understand the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
2. Identify meteorological aspects of air pollution dispersion
3. Determine the ambient air quality and identify, formulate and solve air and noise pollution problems
4. Understand to Control gaseous contaminants
5. Identify and control noise pollution

UNIT - I

Air pollution: composition and structure of atmosphere, global implications of air pollution. Classification of air pollutants: particulates, hydrocarbon, carbon monoxide, oxides of sulphur, oxides of nitrogen and photo chemical oxidants. Indoor air pollution, Effects of air pollutants on humans, animals, property and plants.

Learning Outcomes:

At the end of the unit, student should able to

- Why the air pollution has been occurring
- What are all the compositions and pollutants causes air pollution.
- Understand the effects of air pollution

UNIT - II

Air pollution chemistry, meteorological aspects of air pollution dispersion; temperature lapse rate and stability, wind velocity and turbulence, plume behavior, dispersion of air pollutants, the Gaussian Plume Model, stack height and dispersion.

Learning Outcomes:

At the end of the unit, student should able to

- Understand the chemistry and metrological aspects of air pollution
- Explain the parameters of chemistry and metrological aspects of air pollution

UNIT - III

Ambient air quality and standards, air sampling and measurements; Ambient air sampling, collection of gaseous air pollutants, collection of particulate air pollutants, stack sampling. Control devices for particulate contaminants: gravitational settling chambers, cyclone separators, wet collectors, fabric filters (Bag-house filter), electrostatic precipitators (ESP).

Learning Outcomes:

At the end of the unit, student should able to

- Understand that what are all the standards, measurements and control devices available for the ambient air quality
- Illustrate the different devices used for controlling the contaminants.

UNIT - IV

Control of gaseous contaminants: Absorption, Adsorption, Condensation and Combustion, Control of sulphur oxides, nitrogen oxides, carbon monoxide, and hydro carbons. Automotive emission control, catalytic convertor, Euro-I, Euro-II and Euro-III specifications, Indian specifications.

Learning Outcomes:

At the end of the unit, student should able to

- Understand the term gaseous contaminants and
- Explain the different methods available to control the gaseous contaminants

UNIT - V

Noise Pollution: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psycho-acoustics and noise criteria, effects of noise on health, annoyance rating schemes; special noise environments: Infra-sound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices.

Learning Outcomes:

At the end of the unit, student able to

- Understand the causes for noise pollution
- List the methods and materials available for basic acoustics
- Measure the sound specification by different devices and methods

TEXT BOOKS:

1. Rao C.S., Environmental Pollution Control Engineering, New Age International editors and publishers, 3rd Edition, 2018.
2. Rao M.N. and Rao H.V.N., Air Pollution Control, Tata McGraw Hill, 2014.
3. S.P. Singal, Air Quality Monitoring and Control Strategy, Narosa Publishing House Pvt. Ltd., 2012.

2460104 - GREEN BUILDINGTECHNOLOGY
(Open Elective – II)

B.Tech. III Year II Sem	**L T P C**
Prerequisites: -	**3 0 0 3**

UNIT-1

Concept of Green Buildings:
Definition of Green Buildings, typical features of green buildings, Necessity, Initiatives, Green buildings in India, Green building Assessment- Green Building Rating Systems for rating, Energy efficient criteria, environmental benefits economic benefits, health and social benefits, Major energy efficiency areas for building, Contribution of buildings towards Global Warming. Life cycle cost of buildings, Codes and Certification Programs

Learning Outcomes:
At the end of this unit, the student will be able to
- Understand the definition, features, and necessity of green buildings and initiatives in India.
- Assess energy efficiency, environmental, economic, social, and health benefits of green buildings.
- Apply concepts of green building assessment, rating systems, life cycle cost, and codes/certifications in real projects.

UNIT-II

Sources of Energy:
Renewable and Non-renewable sources of energy; Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources; potential of these sources, hazards, pollution; Global scenario with reference to demand and supply in India, Global efforts to reduce carbon emissions, Performance testing (new and existing): Building modeling, Energy analysis, Commissioning, Metering, Monitoring.
Carbon emission: Forecasting, Control of carbon emission, Air quality and its monitoring carbon foot print; Environmental issues, Minimizing carbon emission, Energy retrofits and Green Remodels.
Learning Outcomes:
At the end of this unit, the student will be able to
- Understand types of energy sources, their potential, hazards, and pollution; learn global and Indian energy scenarios.
- Analyze carbon emissions, energy performance testing, and building modeling for efficiency.
- Apply concepts to minimize carbon footprint, implement energy retrofits, and green remodels for environmental benefit.

UNIT-III

Green Building Materials: Sustainably managed Materials, depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials; Embodied Energy of Materials, Green cement, Biodegradable materials, Smart materials, Manufactured Materials, Volatile Organic Compounds (VOC's), Natural Non-Petroleum Based Materials, Recycled materials,
Renewable and Indigenous Building Materials, Engineering evaluation of these materials. **Green Building Planning and Specifications:** Environment friendly and cost effective Building Technologies, Integrated Life cycle design of Materials and Structures, Green Strategies for Building Systems, Alternative Construction Methods, Energy Conservation Measures in Buildings, Waste &Water management and Recycling in Sustainable Facilities, Heating, Ventilation and Air Conditioning, Passive Solar & Daylight, Plumbing and its Effect on Energy Consumption

Learning Outcomes:

At the end of this unit, the student will be able to

- Assess embodied energy, environmental impact, and suitability of various green and sustainable materials.
- Apply principles of green building planning, energy conservation, and alternative construction methods in building design.
- Implement strategies for waste & water management, energy efficiency, and sustainable facility design.

UNIT-IV

Design of Green Buildings; Sustainable sites, Impact of building 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, Advanced Green building technologies and innovations

Learning Outcomes:

At the end of this unit, the student will be able to

- Examine the impact of buildings on the environment, energy use, water consumption, and indoor environmental quality.
- Apply principles of bioclimatic, solar passive, and sustainable development in building design.
- Implement cost-efficient, reliable, and innovative green building technologies for overall sustainability.

UNIT-V

Construction of Green Buildings: Energy efficient construction, Practices for thermal efficiency and natural lighting. Eco- friendly water proofing; ECB codes building rating, Maintenance of green buildings, Cost and Performance Comparisons and Benchmarking, Green Project Management Methods and Best Practices, Cost/benefit analysis of green buildings, Life-cycle analysis of green buildings, Case studies of rated buildings (new and existing)

Learning Outcomes:

At the end of this unit, the student will be able to

- Apply energy-efficient construction practices, thermal efficiency, natural lighting, and eco- friendly waterproofing.
- Assess cost, performance, life-cycle analysis, and maintenance of green buildings.
- Compare green building projects against codes, rating systems, and best practices for continuous improvement.

Text Books:

1. "Green Building: Principles & Practices"-Dr. Adv. Harshul Salva
2. "Green building materials and techniques" -Mr. Vinod B.R & Mrs. Shobha R
3. "*Green* Building Materials and Civil Engineering"- Vivek Pratap Chauhan

REFERENCE 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 – SPON Press
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
5. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design
6. Understanding Green Building Guidelines: For Students and Young Professionals, Traci Rose Rider, W. W. Norton & Company Publisher.
7. Understanding Green Building Materials, Traci Rose Rider, W. W. Norton & Company Publisher.

2460184 - ENVIRONMENTAL ENGINEERING LABORATORY

B.Tech. III Year II Sem **L T P C**

Prerequisites: Environmental Engineering **0 0 2 1**

Course Objectives: The objectives of the course are to

1. Perform the experiments to determine water and waste water quality
2. Understand the water &waste water sampling, their quality standards
3. Estimate quality of water, waste water, Industrial water

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

1. Understand about the equipment used to conduct the test procedures
2. Determination of pH, Electrical Conductivity
3. Determination of Acidity and Alkalinity
4. Examine and Estimate water, waste water, air and soil Quality
5. Develop a report on the quality aspect of the environment

List of Experiments

1. Determination of pH
2. Determination of Electrical Conductivity
3. Determination of Total Solids (Organic and inorganic)
4. Determination of Acidity
5. Determination of Alkalinity
6. Determination of Hardness (Total, Calcium and Magnesium Hardness)
7. Determination of Chlorides
8. Determination of optimum coagulant Dosage
9. Determination of Dissolved Oxygen (Winkler Method)
10. Determination of COD
11. Determination of BOD/DO
12. Determination of Residual Chlorine

REFERENCES:

1. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
2. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson / Brooks/ Cole; Second Edition2008.
3. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York1985.
4. Met Calf and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata

McGraw- Hill, New Delhi.

5. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi.
6. Plumbing Engineering. Theory, Design and Practice, S.M. Patil,1999
7. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
8. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.

2460185 - TRANSPOTATION ENGINEERING LABORATORY

B. Tech. III Year II Sem **L T P C**

Pre-requisites: Transportation Engineering **0 0 2 1**

Course Objectives: The objective of the course is

1. To gain the practical knowledge of properties of Highway materials
2. To gain the practical knowledge of traffic surveys.
3. To gain the practical knowledge of Bitumen mix designs.

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

1. determine crushing, abrasion and impact value of Highway materials
2. determine specific gravity and water absorption of Highway materials
3. determine Flakiness and elongation Indices of coarse Aggregates
4. identify ductility value of bitumen
5. Determination of Traffic Volume and parking studies

Note: In the following list of 15 experiments the student has to complete minimum of 12 experiments

List of Experiments:

SECTION I: ROAD AGGREGATES

1. Determination of Aggregate Crushing value.
2. Determination of Aggregate Impact Test.
3. Determination of Specific Gravity and Water Absorption.
4. Determination of Abrasion value of aggregate.
5. Determination of Flakiness and elongation Indices of coarse Aggregates.
6. Determination of Attrition value of aggregate.

SECTION II: BITUMINOUS MATERIALS

7. Determination of Penetration Value.
8. Determination of Ductility value of bitumen.
9. Determination of Softening Point value.
10. Determination of Marshal Stability value
11. Determination of Flash and fire point temperature.

SECTION III: TRAFFIC STUDIES

12. Determination of Traffic Volume Counts-Mid Blocks
13. Determination of Traffic Volume Counts-Junctions
14. Determination of Spot speed study.
15. Determination of Parking Studies

TEXT BOOKS:

1. Laboratory Manual in Highway Engineering by Ajay K. Duggal and Vijay Highway

Material Testing by Khanna S.K., Justo C.E.G, Nem Chand & Bros.

2. Principles and practice of Highway Engineering, L.R Kadiyali & N.B.Lal, Khanna, 2007.
3. Traffic Engineering and Transportation planning, L.R Kadiyali, Khanna publications, 2007.

2460186 - COMPUTER AIDED DESIGN AND DETAILING LABORATORY

B.Tech. III Year II Sem **L T P C**

Prerequisites: Computer Aided Civil Engineering Drawing or **0 0 2 1**

Auto CAD Principles –Excel- Structural Engineering -1 & 2

Course Objectives: The objectives of the course are to

1. Learn the usage of any fundamental software for design
2. Create geometries using pre-processor
3. Analyze and Interpret the results using post processor
4. Design the structural elements

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

1. Model the geometry of real-world structure Represent the physical model of structural element/structure
2. Analysis & Design of determinate structures using a software
3. Analysis & Design of continuous beams and frames
4. Analysis & Design of Roof Trusses
5. Design and detailing of RCC and steel elements

LIST OF EXPERIMENTS

1. Analysis & Design determinate structures using a software
2. Analysis & Design of fixed & continuous beams using a software
3. Analysis & Design of Plane Frames
4. Analysis & Design of space frames
5. Analysis & Design of residential building
6. Analysis & Design of Roof Trusses
7. Detailing of RCC beam and RCC slab
8. Design and detailing of built up steel beam
9. Detailing of Steel built up compression member
10. Developing a design programme for foundation using EXCEL Spread Sheet

Note: Drafting of all the exercises is to be carried out using commercially available designing software's.

2470025 – HUMAN VALUES AND PROFESSIONAL ETHICS

B.Tech. III Year II Sem **L P T C**

0 0 0 0

Course Objectives:

The students will understand the importance of Values and Ethics in their personal lives and professional careers. The students will learn the rights and responsibilities as an employee, team member and a global citizen.

Course Outcomes:

1. Practice the moral values that ought to guide the Engineering profession.
2. Discover of the set of justified moral principles of obligation, ideals that ought to be endorsed by the engineers and apply them to concrete situations
3. Justify the need for protection of human rights and to know about concept of women empowerment
4. Appreciate the Ethical issues and know the code of ethics adopted in various professional body's and industries
5. Know the successful functioning of democracy in India

UNIT-I

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

Learning outcomes:

- Understand the concept of self-exploration and its role in personal growth.
- Explain the need, basic guidelines, content, and process of value education.

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 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.

Learning outcomes:

- Understand the body as an instrument of the 'I' for action, perception, and enjoyment.
- Analyze the harmony between 'I' and body through concepts of Sanyam (self-restraint) and Swasthya (well-being).

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

Learning outcomes:

- Differentiate between intention and competence, and between respect and mere differentiation in relationships.
- Explain the concept of harmony in the family as the basic unit of human interaction.

UNIT IV

UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE - WHOLE EXISTENCE AS CO-EXISTENCE

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

Learning outcomes:

- Understand the interconnectedness and mutual fulfillment among the four orders of nature.
- Analyze the principles of recyclability and self-regulation in natural systems.

UNIT V

IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

A. Ability to utilize the professional competence for augmenting universal human order

B. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,

C. Ability to identify and develop appropriate technologies and management patterns for above production systems.

D. Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal Human Order.

E. At the level of individual: as socially and ecologically responsible engineers, technologists and managers

F. At the level of society: as mutually enriching institutions and organizations.

Learning outcomes:

- Understand the foundations of humanistic education, constitution, and universal order.
- Explain the natural acceptance of human values and the definitiveness of ethical human conduct.

Text Books:

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

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

Reference Books:

1. Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
3. A Nagraj, 1998 Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986, 1991.
5. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.

IV-I

2470134: ESTIMATION, COSTING AND PROJECT MANAGEMENT

B.Tech. IV Year I Sem. **L T P C**

3 0 0 3

Course Objectives:

1. The subject provides process of estimations required for various work in construction.
2. To have knowledge of using SOR & SSR for analysis of rates on various works and the basics of planning tools for construction projects.

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

1. Understand the technical specifications for various works to be performed for a project and how these impact the cost of a structure.
2. Quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.
3. Understand how competitive bidding works and how to submit a competitive bid proposal.
4. An idea how construction projects are administered with respect to contract structures and issues.
5. An ability to put forward ideas and understandings to others with effective communication processes

UNIT – I

General items of work in Building – Standard Units, Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimation - Detailed Estimates of Buildings.

Learning outcomes:

At the end of this unit, the student will be able to

- Identify building work items and standard units.
- Estimate quantities and costs using various methods.
- Prepare detailed building estimates from drawings.

UNIT – II

Reinforcement bar bending and bar requirement schedules - Earthwork for roads and canals.

Learning Outcomes:

At the end of this unit, the student will be able to

- Prepare reinforcement bar bending and bar requirement schedules accurately.
- Calculate and estimate earthwork quantities for roads and canals.

UNIT – III

Rate Analysis – Working out data for various items of work over head and contingent charges.

Learning Outcomes:

At the end of this unit, the student will be able to

- Calculate rates for different items of construction work.
- Include overhead and contingent charges in cost analysis.
- Prepare accurate data for project budgeting and estimation.

UNIT- IV

Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation - Standard specifications for different items of building construction.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand different **types of construction contracts** and their documents.
- Comprehend **conditions of contract** and procedures for **valuation**.
- Apply **standard specifications** for various building construction items.

UNIT- V

Construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts.

Networks: Basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks. PERT- Assumptions underlying PERT analysis, determining three-time estimates, analysis, slack computations, calculation of probability of completion

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand stages of project planning and roles of client and contractor.
- Develop plans, schedules, work breakdown structures, and assess productivity and durations.
- Apply planning techniques including Bar Charts, Gantt Charts, CPM, and PERT for sequencing, float calculation, and project completion probability.

NOTE: NUMBER OF EXERCISES PROPOSED:

1. Three in Flat Roof & one in Sloped Roof
2. Exercises on Data – three Nos.

TEXT BOOKS:

1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Estimating and Costing by G.S. Birdie
3. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016
4. Chitkara, K. K. Construction Project Management. Tata McGraw-Hill Education, 2014

REFERENCE BOOKS:

1. Standard Schedule of rates and standard data book by public works department.
2. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works –
   B.I.S)
3. Estimation, Costing and Specifications by M. Chakravorti; Laxmi publications.
4. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
5. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
6. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015.

2470135 – WATER RESOURCES ENGINEERING

B. Tech. IV Year I Sem **L T P C**
Pre-requisites: Fluid Mechanics & Hydraulics and Hydraulic Machinery **2 0 0 2**

Course objectives: The objective of the course is
1. To study occurrence movement and distribution of water
2. To know the estimation of hydrologic parameters like evaporation, infiltration
3. To understand the concept of unit hydrograph
4. To know the basic principles and movement of groundwater
5. To impart the knowledge of various irrigation techniques, requirements of the crops,
6. To learn about design of irrigation canals which are associated with sediment problem

Course Outcomes: At the end of the course the student will able to
At the end of the course, the student will be able
1. Understand various components of hydrologic cycle
2. Evaluate various runoff measurements technique
3. Apply the concepts of movement of groundwater beneath the earth
4. Apply the knowledge of various irrigation techniques
5. Analyze the requirements of the crops
6. Use components of designing unlined and lined irrigation canals.

UNIT - I:
HYDROLOGY: Hydrologic cycle, types and forms of precipitation, rainfall measurement, computation of average rainfall over a basin, Adjustment of record, Rainfall Double Mass Curve. Evaporation, factors affecting evaporation, measurement of evaporation- Evapotranspiration estimation Infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.
Learning Outcomes:
At the end of this unit, the student will be able to
- Understanding of hydrology and its application in varied areas of civil engineering
- Illustrate the methods measuring rainfall
- Interpret the rainfall over a drainage basin
- Explain the need of measuring the abstractions
- Assess the losses from rainfall

UNIT - II:
HYDROGRAPHS: Distribution of Runoff - Factors affecting Runoff - Rational Formulae. Hydrograph Analysis Flood Hydrography - Effective Rainfall - Base Flow - Base Flow Separation - Direct Runoff Hydrograph - Unit Hydrograph, definition, and limitations of applications of Unit hydrograph, derivation of Unit Hydrograph from Direct Runoff Hydrograph and vice versa - S-hydrograph, Synthetic Unit Hydrograph.
Learning Outcomes:
At the end of this unit, the student will be able to
- Understand the runoff cycle
- Interpret the discharge over a basin using hydrographs
- Explain the concept of s-hydrograph
- Assess the runoff from ungauged basin using synthetic unit hydrograph
- Apply the unit hydrograph theory in flood estimation

UNIT - III:

GROUNDWATER: Groundwater Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, Darcy's law, radial flow to wells in confined and unconfined aquifers, Types of wells, Well Construction - Well Development.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the movement of groundwater
- Explain the groundwater properties that cause flow
- Assess the groundwater properties
- Interpret the flow of water through different subsurface layers
- Understand the well construction and development techniques

UNIT - IV:

IRRIGATION: Necessity and Importance of Irrigation, ill effects of irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility - Crop Rotation, preparation of land for Irrigation, standards of quality for Irrigation water. Soil-water-plant relationship, vertical distribution of soil moisture, soil moisture constants, Duty and delta, factors affecting duty- Depth and frequency of Irrigation, irrigation requirements and efficiencies-Water Logging.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the need of irrigation in India
- Illustrate different methods of irrigation
- Establish the relation between soil-water-plant
- Assess the duty and delta for crop
- Design the required discharge for crop

UNIT - V

CANALS: Classification of canals, Design of Irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, IS standard for a canal design, canal lining.

Learning Outcomes:

At the end of this unit, the student will be able to

- Classify the irrigation canals
- Understand the importance of silt in canal design
- Design the irrigation canals using silt concept
- Illustrate the lining materials
- Apply the silt theories in canal design

TEXT BOOKS:

1. Engineering hydrology by Jayram Reddy, Laxmi publications pvt. Ltd., New Delhi.
2. Irrigation and water power engineering by Punima & Lal, Laxmi publications pvt. Ltd., New Delhi.

REFERENCES:

1. Elementary hydrology by V. P. Singh, PHI publications.
2. Irrigation and Water Resources & Water Power by P. N. Modi, Standard Book House.
3. Water Resources Engineering - I by Dr. G. Venkata Ramana, Academic Publishing Company.
4. Irrigation Water Management by D. K. Manjinder, Printice Hall of India.
5. Irrigation and Hydraulic structures by S. K. Grag.
6. Applied hydrology by Ven Te Chow, David R. Maidment Larry W. Mays Tata Mc. Graw Hill.
7. Introduction to hydrology by Warren Viessvann, Jr, Garyl. Lewis, PHI.

2470149 – GROUNDWATER HYDROLOGY
(Professional Elective – III)

B.Tech. IV Year I Sem **L T P C**
Prerequisites: Hydraulics and Fluid Mechanics **3 0 0 3**

Course objectives: The objectives of the course are:

1. To explain the concepts of Groundwater Development and Management.
2. To demonstrate and derive the basic equations used in Groundwater development and management and the corresponding equations
3. To know the investigations, field studies to conduct basic ground water studies.

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

1. Identify different fundamental equations and concepts as applied in the Groundwater studies
2. Derive differential equation governing groundwater flow in three dimensions
3. Analyses plumbing test data
4. To solve groundwater mathematical equations and analyze pumping tests in steady and non-steady flow cases
5. Investigate surface and subsurface exploration

UNIT – I:

Groundwater Occurrence: Groundwater hydrologic cycle, origin of groundwater, 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. Ground Water Movement-Permeability, Darcy's law, storage coefficient, Transmissivity, Differential equation governing ground water flow in three dimensions derivation, ground water flow equation in polar coordinate system, ground water flow contours and their applications.

Learning Outcomes:

At the end of this unit, the student will be able to

- Describe the groundwater cycle and aquifer types.
- Understand porosity, specific yield, and retention.
- Apply Darcy's law and groundwater flow equations.
- Interpret groundwater flow contours.
- Analyze rock properties affecting groundwater movement.

UNIT – II:

Analysis of Pumping Test Data-I: Steady groundwater flow towards a well in confined and unconfined aquifers-Dupuit and Theis equations, assumptions, formation constants, yield of an open well interface and well tests.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand **steady groundwater flow** towards wells in confined and unconfined aquifers.
- Apply **Dupuit and Theis equations** with their assumptions and formation constants.
- Calculate **well yield** and interpret **well test results**.

UNIT - III

Analysis of Pumping Test Data-II: Unsteady flow towards well-Non-Equilibrium equations, Theis solution, Jocob and Chow's Simplifications, Leak aquifers.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand unsteady groundwater flow towards wells using non-equilibrium equations.

- Apply Theis solution and its simplifications by Jacob and Chow.
- Analyze flow in leaky aquifers.

UNIT - IV

Surface and sub-surface Investigation: surface methods of exploration-Electrical resistivity method and Seismic refraction methods. Subsurface methods geophysical logging and resistivity logging. Concept of artificial recharge of ground water, recharge methods, Applications of GIS and RS in artificial recharge of ground water along with case studies.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand **surface exploration methods** like electrical resistivity and seismic refraction.
- Apply **subsurface methods** such as geophysical and resistivity logging.
- Explain **artificial groundwater recharge methods** and their applications.
- Utilize **GIS and remote sensing** for planning recharge projects with case studies.

UNIT - V

Saline water intrusion in aquifer: Occurrence of saline water intrusion, Ghyben-Herzberg relation, Shape of interface, control of water intrusion. Ground water basin management-case studies.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand **saline water intrusion** and its occurrence in coastal aquifers.
- Apply the **Ghyben-Herzberg relation** and analyze the **interface shape**.
- Learn methods for **controlling saline water intrusion**.
- Explore **groundwater basin management** through case studies.

TEXT BOOKS:

1. Ground water by H.M. Raghunath, Wiley Eastern Ltd.
2. Ground water Hydrology by David Keith Todd, John Wiley & Son, New York.
3. Groundwater System Planning & Management, R. Willes & W.W.G. Yeh, Prentice Hall.

REFERENCES:

1. Ground water by Bawvwr, John Wiley & Sons.
2. Applied Hydrogeology by C.W. Fetta, CBS Publishers & Distributors.
3. Ground Water Assessment, Development and Management by K R Karanth, McGraw Hill Publications.

2470150 – DESIGN OF HYDRAULIC STRUCTURES
(Professional Elective – III)

B.Tech. IV Year I Sem **L T P C**
Prerequisites: Hydraulics, Hydrology & Water Resources Engineering **3 0 0 3**

Course Objectives: To study various types of storage works and, diversion headwork, their components and design principles for their construction.

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

1. Know types of water retaining structures for multiple purposes and its key parametersconsidered for planning and designing
2. Understand details in any Irrigation System and its requirements
3. Design of earth dam
4. Design of spillway
5. Know, Analyze and Design of a irrigation system components

UNIT - I
Storage Works-Reservoirs - Types of reservoirs, selection of site for reservoir, zones of storage of a reservoir, reservoir yield, estimation of capacity of reservoir using mass curve- Reservoir Sedimentation-Life of Reservoir. Types of dams, factors affecting selection of type of dam, factors governing selection of site for a dam.
Learning Outcomes:
At the end of this unit, the student will be able to

- Understand types of reservoirs and factors for site selection.
- Analyze zones of storage, reservoir yield, and capacity estimation using mass curves.
- Learn about reservoir sedimentation and lifespan.
- Understand types of dams and factors affecting dam type and site selection.

UNIT - II
Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile, and practical profile of a gravity dam, limiting height of a low gravity dam, Factors of Safety - Stability Analysis, Foundation for a Gravity Dam, drainage and inspection galleries.
Learning Outcomes:
At the end of this unit, the student will be able to

- Identify forces acting on gravity dams and common causes of failure.
- Understand elementary and practical profiles and limiting height of low gravity dams.
- Apply stability analysis, factors of safety, and foundation considerations.
- Learn about drainage and inspection galleries in dam design.

UNIT - III
Earth dams: types of Earth dams, causes of failure of earth dam, criteria for safe design of earth dam, seepage through earth dam-graphical method, measures for control of seepage. Spillways: types of spillways, Design principles of Ogee spillways - Spillway gates. Energy Dissipaters and Stilling Basins Significance of Jump Height Curve and Tail Water Rating Curve - USBR and Indian types of Stilling Basins.
Learning Outcomes:
At the end of this unit, the student will be able to

- Understand types of earth dams, causes of failure, and safe design criteria.
- Analyze seepage through earth dams and methods for seepage control.

- Learn types and design principles of spillways, including Ogee spillways and gates.
- Understand energy dissipaters, stilling basins, and the significance of jump height and tail water rating curves.

UNIT - IV

Diversion Head works: Types of Diversion head works- weirs and barrages, layout of diversion head work - components. Causes and failure of Weirs and Barrages on permeable foundations, -Silt Ejectors and Silt Excluders Weirs on Permeable Foundations – Creep Theories - Bligh's, Lane's and Khosla's theories, Determination of uplift pressure- Various Correction Factors – Design principles of weirs on permeablefoundations using Creep theories - exit gradient, U/s and D/s Sheet Piles - Launching Apron.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand types and components of diversion headworks, including weirs and barrages.
- Analyze causes of failure of weirs and barrages on permeable foundations.
- Apply Bligh's, Lane's, and Khosla's creep theories for design of weirs.
- Determine uplift pressures, exit gradients, and use sheet piles and launching aprons in design.

UNIT - V

Canal Falls - types of falls and their location, Design principles of Notch Fall and Sarada type Fall. Canal regulation works, principles of design of cross and distributary head regulators, types of Canal escapes - types of canal modules, proportionality, sensitivity, setting and flexibility. Cross Drainage works: types, selection of suitable type, various types, design considerations for cross drainage works

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand types of canals falls and their suitable locations.
- Apply design principles for Notch Falls and Sarada type Falls.
- Learn canal regulation works, including cross and distributary head regulators.
- Understand types of canal escapes and principles of module design.

TEXT BOOKS:

1. Irrigation Engineering and Hydraulic structures by Santhosh kumar Garg, Khanna Publishers.
2. Irrigation engineering by K. R. Arora Standard Publishers.
3. Irrigation and water power engineering by Punmia & Lal, Laxmi publications Pvt. Ltd., NewDelhi.

REFERENCES:

1. Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta.
2. Irrigation Engineering by R.K. Sharma and T.K. Sharma, S. Chand Publishers 2015.
3. Irrigation Theory and Practice by A. M. Micheal Vikas Publishing House 2015.
4. Irrigation and water resources engineering by G.L. Asawa, New Age International Publishers.

2470151 – WATERSHED MANAGEMENT
(Professional Elective – IV)

B.Tech. IV Year I Sem **L T P C**
Prerequisites: Hydrology & Water Resource Engineering **3 0 0 3**

Course Objectives:
1. To understand different watershed Behaviour
2. To be able to interpret runoff data and quantify erosion by using various modeling methods.
3. To understand land use classification and impact of land use changes on hydrological cycle parameters.

Course Outcomes: At the end of the course, the student will be able to
1. Understand the concept of sustainable development
2. Identify causes of soil erosion and design soil conservation measures in a watershed
3. Know the principle of water harvesting
4. Design of rainwater harvesting structures.
5. Plan and design water harvesting and groundwater recharge structures

UNIT - I

Definition and concept of Watershed: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

Learning Outcomes:
At the end of this unit, the student will be able to
- Understand the definition and concept of a watershed.
- Explain the objectives and need for watershed development, especially in India.
- Apply integrated and multidisciplinary approaches for effective watershed management.

UNIT - II

Characteristics of Watershed: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

Learning Outcomes:
At the end of this unit, the student will be able to
- Identify physical, climatic, and hydrological characteristics of watersheds.
- Understand land use, vegetation, geology, soils, and socio-economic features.
- Collect and analyze basic data required for watershed management.

UNIT - III

Principles of Erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation. Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rockfill dams, brushwood dam, Gabion.

Learning Outcomes:
At the end of this unit, the student will be able to
- Understand types and causes of erosion and their effects on land fertility.
- Estimate soil loss using methods like the Universal Soil Loss Equation.
- Apply erosion control measures such as contour techniques, bunding, terracing, and check structures.

UNIT - IV

Water Harvesting: Rainwater harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds and percolation tanks. Land Management: Land use and land capability classification, management of forest, agricultural, grassland and wild land, reclamation of saline and alkaline soils.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand rainwater and catchment harvesting methods and structures.
- Learn soil moisture conservation and artificial recharge techniques.
- Apply land use, land capability classification, and management of different land types, including soil reclamation.

UNIT - V

Ecosystem Management: Role of Ecosystem, crop husbandry, soil enrichment, inter mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture, silvi pasture, horticulture, social forestry and afforestation.

Applications: Planning of watershed management activities, people's participation, preparation of action plan, administrative requirements. Social aspects of watershed management, community participation, private sector participation, industrial issues, socio-economy, integrated development, water legislation and implementations, case studies, applications of geospatial techniques in watershed management systems.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand ecosystem management and sustainable agriculture practices.
- Plan and implement watershed management with community participation.
- Apply social, economic, and geospatial aspects in watershed management.

TEXT BOOKS:

1. Watershed Management by JVS Murthy, New Age International publ., New Delhi, 1998.
2. Water Resources Engineering by R. Awurbs and WP James, Prentice Hall Publishers.
3. Land Water Management by VVN Murthy, Kalyani Publishers.

REFERENCES:

1. Irrigation and Water Management by D.K. Majumdar, Prentice Hall, New Delhi, 2000.
2. Hydrologic Modeling of Small Watersheds by C.T. Haan, H.P. Johnson, D.L. Brakensiek, ASAE, Michigan, 1982.

2470152 – WATER SUPPLY NETWORK
(Professional Elective – IV)

B.Tech. IV Year I Sem **L T P C**
Prerequisites: Hydrology & Water Resource Engineering **3 0 0 3**

Course Objectives: The objectives of the course are

- Understand the principles and components of water supply systems.
- Learn to design and analyze water distribution networks for urban and rural areas.
- Develop skills in planning, operation, and management of water supply networks.

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

1. Gives a broad outline of the various facets of water usage in daily life.
2. Narrates the origin of Natural waters and also to synthesize it for regular use.
3. How to conservative drinking water and how to utilize non-potable water for various other uses.
4. Explains how the water from a reservoir reaches the consumer.
5. Know the quality of water used for industry

UNIT - I

Water and life: Necessity of water – Domestic demand – Public demand – Irrigation – Transportation – Sanitation – Dilution of wastewaters – Dust palliative – Recreation – Fire protection.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the necessity of water for various human and societal needs.
- Explain water requirements for domestic, public, irrigation, and recreational purposes.
- Recognize water's role in sanitation, waste dilution, dust control, and fire protection.

UNIT - II

Sources of water: Surface sources – Ground sources – Water from atmosphere – Desalination – Recycling of waste water – Recharging of aquifers.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify various sources of water including surface, groundwater, and atmospheric sources.
- Understand desalination, wastewater recycling, and aquifer recharge methods.
- Evaluate suitability of different sources for domestic, industrial, and irrigation use.

UNIT - III

Dual supply of water: Potable and non-potable water – Protected water – Grey water – Black water – Water borne diseases – water related diseases – Sewage Irrigation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand dual water supply systems for potable and non-potable use.
- Differentiate grey water, black water, and protected water.
- Recognize waterborne diseases and applications like sewage irrigation.

UNIT - IV

Distribution of water: Based on topography – Gravity distribution – Direct pumping – Combined pumping and gravity flow.Service Reservoirs – Continuous supply – Intermittent supply – Networks of distribution – Hardy cross method – Emergency water supply as in case of fire accidents – Valves, hydrants and meters.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand methods of water distribution: gravity, direct pumping, and combined systems.
- Learn about service reservoirs, continuous and intermittent supply, and distribution networks.
- Apply concepts of Hardy Cross method, emergency water supply, and use of valves, hydrants, and meters

UNIT - V

Industries and water: Location of Industry with reference tosurface sources of water – Quality of water required for industrial operations – characteristics of waste water produced – Standards for letting industrial effluents into sources of water.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand industrial water requirements and factors influencing site selection near water sources.
- Identify characteristics of industrial wastewater and quality standards.
- Apply regulations and standards for discharge of industrial effluents into water bodies.

TEXT BOOKS:

1. Environmental Engineering by S.K. Duggal
2. Water and Waste water technology by Hammer and Hammer
3. Environmental engineering by Peery, Rowe and Tehabanaglous

2470153 – RAILWAY, AIRPORT AND HARBOUR ENGINEERING
(Professional Elective – IV)

B.Tech. IV Year I Sem **L T P C**
Prerequisites: Transportation Engineering **3 0 0 3**

Course Objectives: the objectives of the course are to
1. Deal with the characteristics of aircrafts related to airport design; runway and taxiway design, runway orientation, length, grading and drainage.
2. Introduce component of railway tracks, train resistance, crossing, signaling, high speed tracks and Metro Rail.
3. Explain the classes of harbors, features, planning and design of port facilities.

Course Outcomes: At the end of this course, the students will be able to:
1. Design runways and taxiways.
2. Design the infrastructure for large and small airports
3. Design various crossings, signals railway track in Railway Projects.
4. Understand track maintenance and operation
5. Plan the harbors and ports projects including the infrastructure required for new ports and harbors.

UNIT – I
Airport Engineering: Introduction to Air Transportation - Aircraft Characteristics – Factors Affecting Selection of site for Airport – Aprons – Taxiway – Hanger – Geometric design - Computation of Runway Length, Correction for Runway Length, Orientation of Runway, Wind Rose Diagram
Learning Outcomes:
At the end of this unit, the student will be able to
- Know about air transportation and its characteristics
- Calculate runway length
- Plot wind rose diagram

UNIT - II
Introduction to Railways: Role of Indian Railways in national development – Railways for Urban Transportation – LRT, Mono Rail, Metro Rail & MRTS. Permanent Way: Components and their Functions: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers – Functions, Materials, Density – Functions, Materials, Ballast, Subgrade and Embankments, Ballast less Tracks.
Learning Outcomes:
At the end of this unit, the student will be able to
- Know about Indian railways and its development
- Understand about Permanent Way, Components and their Functions
- Classify the types of rails

UNIT – III
Geometric Design of Railway Track: Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal/Vertical Curves.
Learning Outcomes:
At the end of this unit, the student will be able to
- Know about geometric design of railway track
- Understand about gradients and grade compensation
- Classify the types of curves

UNIT – IV

Track maintenance and Operation: Points and Crossings - Turnouts, Stations and Yards – Level Crossings. Signaling and Interlocking - Track Circuiting - Track Maintenance.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know about points and crossings
- Analyze signaling and interlocking
- Explain track circuiting and maintenance

UNIT – V

Dock & Harbour Engineering: Water Transportation: Ports and Harbours - Types of water transportation, water transportation in India, Ports and harbours: requirements, classification. Harbour works: breakwaters, jetties, fenders, piers, wharves, dolphins, etc., Navigational aids: types, requirements, light house, beacon lights, buoys, Port facilities: general layout, development, planning, facilities, terminals. Docks and repair facilities: design, dry docks, wet docks, slipways, Locks and lock gates: materials, size, Dredging: classification, dredgers, uses of dredged materials.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know about ports and harbours
- Understand the requirements for ports and harbours and explain the navigational aids

TEXT BOOKS:

1. Venkataramaiah C (2016), "Transportation Engineering Vol II – Railways, Airports, Docks, Harbors, Bridges and Tunnels", Universities Press (India) Private Limited, Hyderabad.
2. J S Mundrey, Railway Track Engineering (5th Edition) McGraw Hill Education 2017.

REFERENCES:

1. Subhash C. Saxena (2008) Airport Engineering, Planning and Design, CBS Publishers and Distributors, New Delhi. (Reprint 2015)
2. R. Srinivasan (2016), Harbour, Dock and Tunnel Engineering 28th Edition, Charotar Publishing House Pvt. Ltd.
3. Saxena SC and Arora S C (2010) A Text Book of Railway Engineering Paperback – 2010, Dhanpat Rai Publications (Reprint 2015)
4. Robert Horonjeff, Francis X. McKelvey, Willian J Sproule, Seth B. Young (2010), Planning & Design of Airports, McGraw-Hill Professional.
5. Transportation Engineering by R. Srinivasa Kumar, University Press India

2470154 – BRIDGE ENGINEERING
(Professional Elective – IV)

B.Tech. IV Year I Sem | **L T P C**
Prerequisites: Structural Engineering, Soil Mechanics, Foundation Engineering, and Water Resources Engineering | **3 0 0 3**

Course Objectives: The objective of the course is
1. Understand different types of bridges and their structural components.
2. Analyze forces and loads acting on bridges.
3. Learn design principles for various types of bridges.

Course Outcomes: At the end of the course, the students will be able to:
1. Understand classification of bridges and Design standards and specifications
2. Design of Slab culvert and T beam bridges.
3. Design of steel bridges
4. Design of Pier, abutment and Bridge bearings.
5. Design of bridge foundations.

UNIT- I
Introduction: Definition, components of bridge, classification of bridges, selection of site, economical span, aesthetics consideration, necessary investigations and essential design data.
Standard Specifications for Roads and Railways Bridges: General, Indian Road Congress Bridge Code, width of carriage way, clearance, various loads to be considered for the design of road and railway bridges, detailed explanation of IRC standard live loads.
Learning Outcomes:
At the end of this unit, the student will be able to
- Classify bridges
- Understand the standard specifications for roads and railway bridges

UNIT- II
Design Consideration for R. C. C. Bridges: Various types of R.C.C. bridges (brief description of each type), design of R.C.C. solid slab and T-beam bridges.
Learning Outcomes:
At the end of this unit, the student will be able to
- Analyze the RCC bridges
- Design of R.C.C. solid slab and T-beam bridges

UNIT- III
Design Consideration for Steel Bridges: Various types of steel bridges (brief description of each), design of plate girder bridge.
Learning Outcomes:
At the end of this unit, the student will be able to
- Analyze the steel bridges
- Design of plate girder bridge

UNIT- IV
Design loads for Piers and abutments - Brief description about approaches, bearings, joints, articulation and other details.
Learning Outcomes:
At the end of this unit, the student will be able to
- Analyze the loads for piers and abutments
- Explain about approaches, bearings, joints, articulation

UNIT - V

Bridge Foundation: Various types, necessary investigations and design criteria of well foundation. Design of well foundation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze the various types of bridge foundation
- Design of well foundation

REFERENCES:

1. Essentials of Bridge Engineering, D. J. Victor, Oxford & IBH Pub, New Delhi.
2. Design of Bridges, N. Krishna Raju, Oxford & IBH, New Delhi.
3. Bridge Deck Analysis, R. P. Pama & A. R. Cusens, John Wiley & Sons.
4. Design of Bridge Structures, T. R. Jagadish & M.A.Jairam, Prentice Hall of India, New Delhi.
5. IRC:112-2011, Code of practice for concrete road bridges
6. IRC:5-1998, Standard specification and code of practice for road bridges (General features of Design)
6. IRC:6-2017, Standard specification and code of practice for road bridges (Loads & Load Combinations)

2470155 – TRAFFIC ENGINEERING
(Professional Elective – IV)

B.Tech. IV Year I Sem **L T P C**
Prerequisites: Transportation Engineering **3 0 0 3**

Course Objectives: To provide engineering techniques to achieve the safe and efficient movement of people and goods on roadways.
Course Outcomes: At the end of the course, the student will be able to:

1. Understand basics principles of Traffic Engineering
2. Analyze parking data and model accidents
3. Determine capacity and LOS.
4. Design signal and signal coordination
5. Develop transportation system management.

UNIT - I
Traffic Studies (Part- I): Basic principles of Traffic, Volume, Speed and Density; Definitions and their interrelationships; Traffic Volume studies - Objectives, Methods of Volume counts, Presentation of Volume Data; Speed studies- Types of Speeds, Objectives, Methods of speed studies, Statistical Methods for speed data Analysis, Presentation of speed data. Delay Studies; Head ways and Gap Studies - Headway and Gap acceptance, Origin and Destination Studies.
Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the traffic studies
- Classify speeds studies
- Explain about delay studies

UNIT - II
Traffic Studies (Part-II) : Parking Studies: parameters of parking, definitions, Parking inventory study, Parking survey by Patrolling method; Analysis of Parking Survey data; Accident studies- Causative factors of Road accidents, Accident data collection: Accident analysis and modeling; Road Safety Auditing, Measures to increase Road safety.
Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the parking studies
- Know about accident studies
- Explain about road safety

UNIT - III
Capacity and LOS Analysis: Introduction to Traffic capacity, Analysis concepts, Level of Service, Basic definitions, Factors affecting Capacity and LOS, Capacity of Urban/Rural Highway, With or without access control, Basic freeway segments - Service flow rate of LOS, Lane width or Lateral clearance adjustment; Heavy vehicle adjustment; Driver population adjustment.
Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the capacity and LOS Analysis
- Analyze the traffic capacity
- Explain the service flow rate and adjustment

UNIT - IV

Signal Designing – Fixed Time signals, Determination of Optimum Cycle length and Signal setting for Fixed Time signals, Warrants for Signals, Time Plan Design for Pre-Timed Control- Lane group analysis, Saturation flow rate and Adjustment factors, Uniform and Incremental Delay, Vehicle Actuated Signals, Signal Coordination.

Learning Outcomes:

At the end of this unit, the student will be able to

- Design signals
- Classify signels
- Explain about signal coordination

UNIT - V

Transportation System Management - Measures for Improving vehicular flow – one way Streets, Signal Improvement, Transit Stop Relocation, Parking Management, Reversible lanes- Reducing Peak Period Traffic - Strategies for working hours, Congestion Pricing, Differential Toll Policies.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know about transportation system management
- Understand the parking management
- Explain the strategies for working hours

TEXT BOOKS:

1. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
2. Principles of Highways Engineering and Traffic Analysis - Fred Mannering & Walter Kilareski, John Wiley & Sons Publication
3. Fundamentals of Transportation Engineering - C. S. Papacostas, Prentice Hall India.

REFERENCES:

1. Traffic Engineering - Theory & Practice - Louis J. Pignataro, Prentice Hall Publication.
2. Traffic Engineering by Roger P. Roess, William R. Mc. Shane, Elena S. Prassas, Prentice Hall, 1977.
3. Transportation Engineering - An Introduction - C. Jotin Khisty, Prentice Hall Publication
4. Fundamentals of Traffic Engineering – McShane & Rogers.
5. Highway Capacity Manual -2000.

2470156 – PAVEMENT ANALYSIS AND DESIGN
(Professional Elective – IV)

B.Tech. IV Year I Sem **L T P C**
Prerequisites: Transportation Engineering **3 0 0 3**

Course Objectives: The study factors affecting pavement design, material characteristics, design of flexible, rigid pavements and low volume roads.
Course Outcomes: At the end of the course, the student will be able to:

1. Characterize the response characteristics of soil, aggregate, asphalt, and asphalt mixes
2. Analyze flexible and rigid pavements
3. Design a flexible pavement using IRC, Asphalt Institute, and AASHTO methods
4. Design a rigid pavement using IRC, and AASHTO methods
5. Design of pavement for low volume roads.

UNIT - I
Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.
Learning Outcomes:
At the end of this unit, the student will be able to

- Classify pavements
- Know the axle types
- Understand the traffic analysis

UNIT - II
Stresses In Pavements: Vehicle-Pavement Interaction: Transient, Random & Damping Vibrations, Steady State of Vibration, Experiments on Vibration, Stress Inducing Factors in Flexible and Rigid pavements. **Stresses in Flexible Pavements**: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts. **Stresses in Rigid Pavements**: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars
Learning Outcomes:
At the end of this unit, the student will be able to

- Understand the Vehicle-Pavement Interaction
- Explain the stresses in flexible and rigid pavements

UNIT - III
Material Characteristics: CBR and Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient, Diametral Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilization and Use of Geo Synthetics.
Learning Outcomes:
At the end of this unit, the student will be able to

- Explain the material characteristics for pavement
- Explain about permanent deformation parameters and other properties

UNIT - IV

Design of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, IRC Methods

Design of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, and Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design.

Learning Outcomes:

At the end of this unit, the student will be able to

- Design the flexible pavements as per HMA and other Base Combinations, AASHTO, IRC Methods
- Design of rigid pavements as per PCA, AASHTO & IRC Specifications

UNIT - V

Design of Pavement for Low Volume Roads: Pavement design for low volume roads, rural road designs – code of practice. **Design of Overlays**: Types of Overlays, Suitability, Design of overlays.

Learning Outcomes:

At the end of this unit, the student will be able to

- Design of pavement for low volume roads
- Design of overlays

TEXT BOOKS:

1. Concrete Pavements, AF Stock, Elsevier, Applied Science Publishers.
2. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc.

REFERENCES:

1. Design of Functional Pavements, Nai C. Yang, McGraw Hill Publications.
2. Principles of Pavement Design, Yoder.J. & Witzorac Mathew, W. John Wiley & Sons Inc.
3. Pavement and Surfacings for Highway & Airports, Micheal Sargious, Applied Science Publishers Limited.
4. IRC Codes for Flexible and Rigid Pavements design.

DISASTER MANAGEMENT
(Open Elective – III)

B.Tech. IV Year I Sem **L T P C**

Prerequisites: - **3 0 0 3**

Course Objectives: The subject provides different disasters, tools and methods for disaster Management.

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

1. Understand Disasters, man-made Hazards and Vulnerabilities
2. Know the concepts of risk management and planning for relief
3. Assess Strengthening capacity for reducing risk
4. Develop coping strategies and plan for industrial safety
5. Formulate disaster risk reduction plan

UNIT - I

Understanding Disaster: Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional)

Hazards and Vulnerabilities: response time, frequency and forewarning levels of different hazards - Characteristics and damage potential of hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand about disaster and its levels
- Know about natural and man-made hazards
- Assess the vulnerability of disaster

UNIT - II

Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Disaster Management Mechanism: Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness

- Planning for Relief

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concepts of risk management and crisis managements
- Know the disaster management cycle
- Realize the disaster prevention, mitigation and preparedness

UNIT - III

Capacity Building: Capacity Building: Concept - Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their

utility in Disaster Management - Legislative Support at the state and national levels
Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs);

Learning Outcomes:

At the end of this unit, the student will be able to

- Know about capacity building
- Understand the disaster resources and their utility in disaster management

UNIT - IV

Coping with Disaster: Coping Strategies; alternative adjustment processes – Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management, Early Warning Systems and Preparedness Planning, Emergency Response and Rescue Operations, Training, Simulation, and Awareness Programs.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know about coping with disaster
- Understand the industrial safety plan, safety norms and survival kits

UNIT - V

Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India - Preparation of state and district disaster management plans

Learning Outcomes:

At the end of this unit, the student will be able to

- Know about disaster management planning
- Understand the disaster management act and policy in India
- Identify the preparation plans of state and district disaster management

TEXT BOOKS:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014.
3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015.

REFERENCES:

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

SUSTIANABLE ENGINEERING
(Open Elective – III)

B.Tech. IV Year I Sem **L T P C**

Prerequisites: - **3 0 0 3**

Course Objectives:
- Understand the principles of sustainable engineering and development.
- Learn methods to minimize environmental impact in engineering projects.
- Explore energy-efficient and resource-conserving technologies.
- Analyze life-cycle assessment and sustainable materials.
- Apply sustainability concepts in planning, design, and construction practices.

Course Outcomes: At the end of the course, the student will be able to
- **Describe** sustainable development and key environmental agreements.
- **Analyze** human activities causing environmental issues and **evaluate** renewable energy methods.
- **Explain** local and global environmental challenges.
- **Compare** carbon emissions in conventional vs. sustainable cities and **propose** industrial sustainability practices.
- **Identify** renewable energy resources and **illustrate** green technology implementation methods.

UNIT- I
Introduction to Sustainable Engineering- Sustainable development, concepts of sustainable development: three pillar model, egg of sustainability model, Atkisson's pyramid model, prism model, principles of sustainable development, sustainable engineering, threats for sustainability. **Environmental Ethics and Legislations** – Environmental ethics and education, multilateral environmental agreements and protocols, enforcement of environmental laws in India – The Water Act, The Air Act, The Environment Act.
Learning Outcomes: At the end of this unit, the student will be able to
- explain the concept of sustainability
- determine the threats for sustainability in any area
- discuss environmental Agreements and Protocols

UNIT- II
Local Environmental Issues- Solid waste, impact of solid waste on natural resources, zero waste concept and three R concept, waste to energy technology: thermo-chemical conversion, biochemical conversion.
Global Environmental Issues- Resource degradation: deterioration of water resources, land degradation, air pollution, climate change and global warming, ozone layer depletion, carbon footprint, carbon trading.
Learning Outcomes: At the end of this unit, the student will be able to
- explain zero waste concept
- discuss different global environmental issues
- describe carbon footprint

UNIT-III

Tools for Sustainability - Environmental management System (EMS), concept of ISO14000, life cycle assessment (LCA): basic components, advantages, disadvantages, case study. Environmental impact assessment (EIA), environmental auditing, bio mimicking, case studies.

Learning Outcomes: At the end of this unit, students will be able to

- explain environmental management System
- describe life cycle assessment for products made of different materials
- discuss environmental impact assessment in real time problems

UNIT- IV

Sustainable Habitat - Concept of green building, green building materials, green building certification and rating: green rating for integrated habitat assessment (GRIHA), leadership in energy and environmental design (LEED) rating, energy efficient buildings, sustainable cities, sustainable transport, sustainable pavements, case studies in sustainability engineering: Green building, sustainable city, sustainable transport system.

Sustainable Industrialization and Urbanization – Sustainable urbanization, industrialization, material selection, pollution prevention, industrial ecology, industrial symbiosis, poverty reduction.

Learning Outcomes: At the end of this unit, the student will be able to

- differentiate between carbon emissions for regular and sustainable cities
- describe the concept of sustainability to develop sustainable habitats
- explain different practices to move industries towards sustainability

UNIT- V

Renewable energy resources- Conventional and non- conventional forms of energy, solar energy, fuel cells, wind energy, small hydro plants, biogas systems, biofuels, energy from ocean, geothermal energy, conservation of energy**.**

Green technology and Green Business: Sustainable business, green technology, green energy, green construction, green transportation, green chemistry, green computing

Learning Outcomes: At the end of this unit, student will be able to

- differentiate between conventional and non- conventional forms of energy
- discuss various methods to implement green technology
- explain green computing

Text Book:

R. L. Rag and Lekshmi Dina Chandran Remesh. *Introduction to Sustainable Engineering*. 2nd Edition, PHI Learning Pvt. Ltd., 2016.

References:

1. D. T. Allen and D. R. Shonnard. *Sustainability Engineering: Concepts, Design and Case Studies*, 1st Edition, Prentice Hall, 2011.

2. A.S. Bradley, A. O. Adebayo, P.Maria. *Engineering applications in sustainable design and development*, 1st Edition, Cengage learning, 2016.

2470187 – PROJECT MANAGEMENT LABORATORY

B. Tech. IV Year I Sem

L	T	P	C
0	0	2	1

Pre-requisites

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

- **Understand** project management concepts, tools, and software applications.
- **Apply** scheduling techniques like CPM and PERT for project planning.
- **Develop** work breakdown structures (WBS) and resource allocation plans.
- **Analyze** project progress using Gantt charts and network diagrams.
- **Evaluate** project risks and prepare mitigation strategies.

LIST OF EXPERIMENTS:

Experiment 1: Introduction & Project Breakdown
- Work Breakdown Structure (WBS)
- Project Scheduling and Network Analysis

Experiment 2: Network Diagram Construction
- Construct network diagrams (Activity-on-Node / Activity-on-Arrow)

Experiment 3: Scheduling using CPM & PERT
- Critical Path Method (CPM)
- Program Evaluation Review Technique (PERT)

Experiment 4: Gantt Chart Preparation
- Gantt Chart Preparation

Experiment 5: Resource Planning & Schedule Adjustment
- Resource Allocation & Levelling
- Adjust schedule to avoid overloads

Experiment 6: Cost Estimation & Cash Flow Scheduling
- Project Cost Estimation and Budgeting
- Setup cash flow schedules

Experiment 7: Project Monitoring & Risk Analysis
- Project Monitoring and Progress Control
- Risk Analysis in Construction Projects

Experiment 8: Quality, Safety & Sustainability Planning
- Quality & Safety Planning
- Life Cycle Costing & Sustainability

Experiment 9: Advanced Scheduling Techniques
- Schedule Compression Techniques
- Crash or fast-track project schedule

Experiment 10: Project Management Application
- Project Reporting, Documentation & Software Practical

References:

1. B.C. Punima, K.K. Khandelwal, Project Planning and Control with PERT and CPM, Laxmi Publications, 2nd Edition, 2018.
2. K.K. Chitkara, Construction Project Management, Tata McGraw-Hill.
3. Saleh Mubarak, Project Scheduling and Management for Construction, Pearson, 3rd Edition.

2470188 – REVIT ARCHITECTURE LABORATORY

B. Tech. IV Year I Sem

L	T	P	C
0	0	2	1

Pre-requisites: Engineering Drawing; Computer Aided Civil Engineering Drawing Lab

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

1. Draw using modify tools
2. Draw walls, doors and windows
3. Draw floors
4. Draw ceilings & roofs
5. Draw stairs, railings, and ramps

LIST OF EXPERIMENTS:

1. Setting up levels and grids.
2. Using Templates and setting of units.
3. Modeling Walls
4. Modeling Doors
5. Modeling Windows, Edit Type
6. Modify Tools, Placing of Components.
7. Curtain Walls, Wall Opening.
8. Modeling floors.
9. Modeling ceilings & roofs.
10. Modeling stairs, railings, and ramps.
11. Text, Dimension, Annotations, Model Text, Model line, Room and Area.
12. Paint, Colour Scheme, creating new Materials, Sweep, Extrude Modeling.
13. Executing Sweep and Extrusion
14. Camera view, Hide elements, Render view, Walkthrough.
15. Massing and Site, top surface, sub region, building pad, site component, parking site.
16. Component Schedule, Creating Title Block.

References:

1. Peter B. and Nigel D., "BIM in Principle and in Practice", 1st Edition, ICE Publishing, 2014.

2. Manuals of Building information modelling software

2440023: CONSTITUTION OF INDIA

B.Tech. IV Year I Sem.

L	T	P	C
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Module 1: Supremacy of the Constitution and Fundamental Rights

- Constitution of India as the supreme law.
- Protection of Fundamental Rights under Part III.
- Limitations on Parliament's power to amend the Constitution (Article 368) and the concept of basic structure.

Module 2: Constitutionalism and Historical Influences

- Concept of constitutionalism and its connection with liberalism.
- Influence of historic revolutions (France, England, America) and European Renaissance & Reformation on legal reforms.
- Borrowing of principles from the UK and USA in framing the Indian Constitution.

Module 3: Social, Political, and Economic Perspectives

- Constitution as a reflection of India's diversity.
- Integration of freedom movement ideals and critique regarding ancient legal heritage.
- Constitution as a dynamic document adapting to societal changes.

Module 4: Constitutional Amendments and Evolution

- Over 100 amendments reflecting political, social, and economic developments since 1950.
- Flexibility and adaptability of law over time.

Module 5: Role of Judiciary and Judicial Activism

- Supreme Court as the guardian of the Constitution.
- Progressive interpretation of constitutional text.
- Recognition of judicial activism and global standing of the Supreme Court.

Course content:

i. Meaning of the constitution law and constitutionalism
ii. Historical perspective of the Constitution of India
iii. Salient features and characteristics of the Constitution of India
iv. Scheme of the fundamental rights
v. The scheme of the Fundamental Duties and its legal status
vi. The Directive Principles of State Policy – Its importance and implementation
vii. Federal structure and distribution of legislative and financial powers between the Union and the States
viii. Parliamentary Form of Government in India – The constitution powers and status of the President of India
ix. Amendment of the Constitutional Powers and Procedure
x. The historical perspectives of the constitutional amendments in India
xi. Emergency Provisions: National Emergency, President Rule, Financial Emergency
xii. Local Self Government – Constitutional Scheme in India
xiii. Scheme of the Fundamental Right to Equality
xiv. Scheme of the Fundamental Right to certain Freedom under Article19
xv. Scope of the Right to Life and Personal Liberty under Article21

2470010 - BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

B. Tech. IV Year I Sem **L T P C**
Prerequisites:- **3 0 0 3**

Course Objectives: To learn the basic business types, impact of the economy on business and firms specifically. To analyze the business from the financial perspective.

Course Outcomes: After completion of syllabus the students will understand the

1. Various forms of business and the impact of economic variables on the business.
2. The demand, supply, production, cost, market structure, pricing aspects are learnt.
3. The students can study the firm's financial position by analyzing the financial statements of a company.

UNIT - I

Introduction to Business and Economics: Business: Structure of Business Firm, Types of Business Entities, Limited Liability Companies, Economics: Significance of Economics, Micro and Macro Economic Concepts, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand business structures and types of entities.
- Explain micro and macroeconomic concepts and business cycles.
- Recognize the role of business economics and business economists.

UNIT – II

Demand Analysis: Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Demand Forecasting: Steps in Demand Forecasting, Methods of Demand Forecasting.

Learning Outcomes:

At the end of this unit, the student will be able to

- can learn about different types of demand,
- Determinants and elasticity of demand concepts thoroughly
- To forecast the demand of different things by using different agreed upon techniques.

UNIT - III

Production, Cost, Market Structures & Pricing: Production, Cost, Market Structures & Pricing: Production Analysis: Factors of Production, Production Function, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Break Even Analysis, and Cost Volume Profit Analysis.

Learning Outcomes:

At the end of this unit, the student will be able to

- Can learn different pricing techniques in different market structures
- Cost functions that determine products life cycle in a long term basis.

UNIT - IV Capital Budgeting

Capital Budgeting: Importance of Capital Budgeting, methods of Capital Budgeting: Traditional Methods: Pay Back Period, Accounting Rate of Return, and Discounting Methods: Net Present Value, Profitability Index, Internal Rate of Return; Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems).

Learning Outcomes:
At the end of this unit, the student will be able to
- Understand techniques for financial evaluation of projects.
- Utilize financial ratios to assess business performance.
- Apply insights for effective decision-making.

UNIT - V Financial Accounting
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, and Preparation of Final Accounts.
Learning Outcomes:
At the end of this unit, the student will be able to
- Understand **accounting concepts, conventions, and the accounting equation**.
- Apply the **double-entry system**, including journalizing, posting to ledger & preparing trial balance.
- Prepare **final accounts** and understand elements of financial statements.

TEXT BOOKS:
1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.
4. I.M. Pandey, Financial Management, 11th Edition, Kindle Edition, 2015.

REFERENCES:
1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

IV-II

2480157 - INDUSTRIAL WASTE WATER TREATMENT
(Professional Elective – V)

B. Tech. IV Year II Sem **L T P C**
Pre-Requisites: Environmental Engineering **3 0 0 3**

Course Objectives: The objective of the course is

1. To enrich the knowledge on sources and characteristics of industrial wastewater.
2. To discuss the different methods of waste water treatment such as de-nitrification, membrane separation, air stripping, etc.
3. To understand the characteristics and composition of wastewater generated from industrial processes.
4. To design and operate effluent treatment plants for joint treatment of raw industrial wastewater and domestic sewerage.

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

1. Distinguish between the quality of domestic and industrial water requirements and wastewater quantity generation.
2. Understand the industrial process, water utilization and waste water generation.
3. Acquire the knowledge on operational problems of common effluent treatment plants.
4. Impart knowledge on selection of treatment methods for industrial wastewater.
5. Understand the characteristics and composition of different Industries

UNIT – I

Sources of Pollution – Physical, Chemical, Organic and Biological properties of Industrial Wastes – Differences between industrial and municipal waste waters – Effects of industrial effluents on sewers and Natural Water Bodies.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the physical, chemical, organic and biological properties of Industrial wastes
- Distinguish between industrial and municipal waste waters

UNIT – II

Pre and Primary Treatment – Equalization, Proportioning, Neutralization, Oil Separation by Floatation – Waste Reduction - Volume Reduction – Strength Reduction.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the Pre and Primary Treatment
- Understand the treatment methods of industrial waste water

UNIT – III

Waste Treatment Methods – Nitrification and De-nitrification – Phosphorous removal – Heavy metal removal – Membrane Separation Process – Air Stripping and Absorption Processes – Special Treatment Methods – Disposal of Treated Waste Water.

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the waste treatment methods
- Know the disposal methods of treated waste water

UNIT – IV

Characteristics and Composition of waste water and Manufacturing Processes of Industries like Sugar, Characteristics and Composition of Industries like Food Processing Industries, Steel, Petroleum Refineries.

Learning Outcomes:
At the end of this unit, the student will be able to

- Explain the characteristics and composition of waste water
- Explain the characteristics and composition of Food Processing Industries, Steel, Petroleum Refineries.

UNIT – V
Characteristics and Composition of Industries like Textiles, Tanneries, Atomic Energy Plants and other Mineral Processing Industries - Joint Treatment of Raw Industrial waste water and Domestic Sewage – Common Effluent Treatment Plants (CETP) – Location, Design, Operation and Maintenance Problems – Economical aspects.
Learning Outcomes:
At the end of this unit, the student will be able to

- Explain the characteristics and composition of Industries like Textiles, Tanneries, Atomic Energy Plants and other Mineral Processing Industries
- Know the common effluent treatment plants
- Understand the economical aspects

TEXT BOOKS

1. Industrial Waste Water Pollution Control by W. Wesley Eckenfelder – McGraw-Hill.
2. Waste Water Treatment by M.N.Rao & A.K.Datta, Oxford & Ibh publisher.

2480158 - WASTE MANAGEMENT

(Professional Elective – V)

B. Tech. IV Year II Sem **L T P C**
Pre-Requisites: Environmental Engineering **3 0 0 3**
Course Objectives: The objective of the course is

1. To study about waste water treatment methods

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

1. Identify the physical and chemical composition of wastes
2. Analyze the functional elements for solid waste management.
3. Analyze the functional elements for liquid waste management.
4. Understand the effluent treatment Plants and its disposal
5. Acquired knowledge in effluent disposal methods.

UNIT – I
Quality requirements of boiler and cooling waters – Quality requirements of process water for Textiles – Food processing and Brewery Industries – Boiler and Cooling water treatment methods.
Learning Outcomes:
At the end of this unit, the student will be able to

- Understand quality requirements of boiler and cooling water.
- Learn water quality standards for textile, food processing, and brewery industries.
- Apply boiler and cooling water treatment methods.

UNIT – II
Basic Theories of Industrial Waste water Management – Volume reduction – Strength reduction – Neutralization – Equalization and proportioning. Joint treatment of industrial wastes and domestic sewage – consequent problems, Industrial waste water discharges into streams. Lakes and oceans and problems.
Learning Outcomes:
At the end of this unit, the student will be able to

- Understand basic theories of industrial wastewater management.
- Apply methods like volume reduction, strength reduction, neutralization, and equalization.
- Analyze challenges of joint treatment with domestic sewage and discharge into water bodies.

UNIT – III
Recirculation of Industrial Wastes – Use of Municipal Waste Water in Industries, Manufacturing Process and design origin of liquid waste from Textiles, Paper and Pulp industries, Thermal Power Plants and Tanneries, Special Characteristics, Effects and treatment methods. Manufacturing Process and design origin of liquid waste from Fertilizers, Distillers, and Dairy, Special Characteristics, Effects and treatment methods.
Learning Outcomes:
At the end of this unit, the student will be able to

- Understand recirculation of industrial wastes and use of municipal wastewater in industries.
- Analyze liquid waste characteristics, effects, and treatment methods from textiles, paper and pulp, thermal power, and tanneries.
- Study waste generation and treatment from fertilizers, distilleries, and dairy industries.

UNIT - IV

Manufacturing Process and design origin of liquid waste from Sugar Mills, Steel Plants, Oil Refineries, and Pharmaceutical Plants, Special Characteristics, Effects, and treatment methods.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand liquid waste generation from sugar mills, steel plants, oil refineries, and pharmaceutical industries.
- Analyze special characteristics and environmental effects of these wastes.
- Learn appropriate treatment methods for industrial effluents.

UNIT – V

Common Effluent Treatment Plants – Advantages and Suitability, Limitations, Effluent Disposal Methods.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept and advantages of Common Effluent Treatment Plants (CETPs).
- Identify their suitability and limitations.
- Learn various effluent disposal methods.

TEXT BOOKS:

1. Waste Water Treatment by M.N. Rao and Dutta, Oxford & IBH, New Delhi.
2. Water and Waste Water technology by Mark J. Hammer and Mark J. Hammer (Jr).

REFERENCES:

1. Solid Waste Engineering by WA. Worrell, P.A Vesilind Cengage Learning, 2012.
2. Solid and Hazardous waste Management M.N Rao and R. Sulthana. B.S Publications, 2012.
3. Liquid waste of Industry by Nemerow Addison- Wesely Educational Publisher.

2480159 - ENVIRONMENTAL IMPACT ASSESSMENT
(Professional Elective – V)

B. Tech. IV Year II Sem **L T P C**
Pre-Requisites: Environmental Engineering **3 0 0 3**
Course Objectives: The objective of the course is

1. To understand the aspects of Environment Impact Assessment methodologies
2. To analyze the impact of development activities. Impact on surface water, Air and Biological Environment, Environment legislation Environment.
3. To learn the different Act's related to Environment

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

1. Identify the environmental attributes to be considered for the EIA study.
2. Assessment of impact of development activities on vegetation and wildlife
3. Procure soil quality and prediction of impact.
4. Identify the suitable methodology and prepare rapid EIA.
5. Know the environmental protection act.

UNIT – I
Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters. E I A Methodologies: introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.
Learning Outcomes:
At the end of this unit, the student will be able to

- Know the basic concept of EIA
- Explain the EIA methodologies

UNIT- II
Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.
Learning Outcomes:
At the end of this unit, the student will be able to

- Assess the impact of development activities on Vegetation and wildlife
- Explain the causes and effects of deforestation

UNIT- III
Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and Incorporation of mitigation measures.
Learning Outcomes:
At the end of this unit, the student will be able to

- Assess the soil quality, impact significance
- Know the mitigation measures

UNIT – IV
Environmental Audit & Environmental legislation objectives of Environmental Audit, Types of environmental Audit, Audit protocel, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report, Post Audit activities.
Learning Outcomes:
At the end of this unit, the student will be able to

- Know the Environmental Audit & Environmental legislation
- Classify environmental Audit
- Evaluation of Audit data and preparation of Audit report

UNIT - V

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Motor Act, Wild life Act. Case studies and preparation of Environmental Impact assessment statement for various Industries.

Learning Outcomes:

At the end of this unit, the student will be able to

- Know the different Act's related with Environmental
- Analyze the case studies and preparation of Environmental Impact assessment statement

TEXT BOOKS:

1. Larry Canter – Environmental Impact Assessment, McGraw-Hill Publications.
2. Environmental Impact Assessment, Barthwal, R. R. New Age International Publications.

REFERENCES:

1. Environmental Pollution by R.K. Khitoliya S. Chand, 2014.
2. Glynn, J. and Gary, W. H. K. - Environmental Science and Engineering, Prentice Hall Publishers
3. Suresh K. Dhaneja - Environmental Science and Engineering, S.K. Kataria & Sons Publication. New Delhi.
4. Bhatia, H. S. - Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.
5. Wathern, P. – Environmental Impact Assessment: Theory & Practice, Publishers Rutledge, London, 1992.

2480160 – SAFETY IN CONSTRUCTION PRACTICES
(Professional Elective – V)

B. Tech. IV Year II Sem **L T P C**
Pre-Requisites: **3 0 0 3**

Course Objectives:

1. Know the safety concepts that have to be adopted in construction
2. Understand the elements of safety programmes
3. Know the awareness on safety practices that has to be ensured during construction.
4. Know about the accident prevention, safety sampling and audit.
5. Know the safety concepts in hand tools, grinding, lifting works and while operating fire fighting equipments.

Course Outcomes:

1. Identify common causes of accidents, and interpret relevant environmental and legal aspects affecting construction safety management.
2. Develop and evaluate effective construction safety programs, incorporating job-site assessment, safety meetings, incentives, and contractual safety obligations.
3. Assess the roles and responsibilities of various organizational levels in promoting a safety culture and managing safety performance in construction projects.
4. Apply safety auditing, accident investigation, and reporting techniques to prevent losses, ensure compliance with safety laws, and enhance overall construction productivity.
5. Implement safety measures for lifting operations, demolition, handling tools, and fire prevention to ensure safe construction site practices.

UNIT I: SAFETY CONCEPTS

Construction accidents - Construction Safety Management: Importance - causes of accident, safety measures- Environmental issues in construction -Construction industry related laws. Human factors in safety

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand construction accidents and their causes.
- Learn safety management practices and measures in construction.
- Analyze environmental issues, relevant laws, and human factors affecting safety.

UNIT II: SAFETY PROGRAMES

Safety Programmes - Construction Safety - Elements of an Effective Safety Programmes - Job-site assessment - Safety Meetings - Safety Incentives. Contractual Obligations - Safety in construction contracts- Substance Abuse - safety Record Keeping.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand elements of effective construction safety programs.
- Learn job-site assessment, safety meetings, and incentives.
- Apply safety practices in contracts, substance abuse prevention, and record keeping

UNIT III: SAFETY PRACTICES

Safety Culture - Safe Workers- Safety and First Line Supervisors - Safety and Middle Managers - Top Management Practices, Company Activities and Safety - Safety Personnel – Sub - contractual Obligation - Project Coordination and Safety Procedures - Workers Compensation

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand safety culture and roles of workers, supervisors, and managers.

- Learn top management practices, company safety activities, and safety personnel responsibilities.
- Apply project coordination, subcontractor obligations, safety procedures, and workers' compensation.

UNIT IV: SAFETY SAMPLING AND AUDIT

Accident prevention-cost of accidents -Safety and productivity-safety provision in the factories act-accident reporting investigation and statistics-total loss control and damage control-Safety sampling-safety audit - critical incident technique- safety equipment - planning and site preparation- safety system of storing construction materials-Excavation - blasting- timbering-scaffolding- safe use of ladders-safety in welding.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand accident prevention, costs, and relation between safety and productivity.
- Learn safety provisions under the Factories Act, accident reporting, investigation, and statistics.
- Apply safety practices in construction: equipment, material storage, excavation, blasting, timbering, scaffolding, ladders, and welding.
- Conduct safety audits, sampling, and critical incident analysis for total loss and damage control.

UNIT V: SAFETY IN LIFTING AND FIRE

Safety in hand tools- Safety in grinding- Hoisting apparatus and conveyors- Safety in the use of mobile cranes Manual handling- Safety in demolition work- Trusses, girders and beams- First- aid- Fire hazards and preventing methods -interesting experiences at the construction site against the fire accidents.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand safety practices for hand tools, grinding, hoisting equipment, and mobile cranes.
- Learn manual handling, demolition safety, and structural safety (trusses, girders, beams).
- Apply first-aid, fire hazard prevention, and learn from construction site fire accident experiences.

Text Books:

1. Construction Safety: Health, Practices, and OSHA (1st Edition); Dr. M. Rashad Islam; McGraw-Hill Education
2. Construction Safety Management and Engineering (2nd Edition); Darryl C. Hill; American Society of Safety Professionals (ASSP)

2480161 – FOUNDATION ENGINEERING
(Professional Elective – VI)

B.Tech. IV Year II Sem **L T P C**
Prerequisites: Reinforced Concrete Design **3 0 0 3**

Course Objectives:
1. To Plan Soil exploration programme for civil Engineering Projects
2. To check the stability of slopes
3. To determine the lateral earth pressures and design retaining walls
4. To determine the Bearing capacity of Soil
5. To design pile group foundation

Course Outcomes: At the end of the course the student will able to
1. Understand the principles and methods of Geotechnical Exploration
2. Stability analysis by various methods
3. Understand earth pressure theories
4. Analyse and design of shallow foundations
5. Analyse and design of deep foundations

UNIT – I
SOIL EXPLORATION: Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test– planning of soil exploration programme, Bore logs and preparation of soil investigation report.
Learning Outcomes (LOs):
After studying this topic, students will be able to:
1. Explain the need and objectives of soil exploration for foundation design.
2. Identify and describe methods of soil exploration and types of borings.
3. Differentiate between disturbed and undisturbed sampling methods.
4. Conduct and interpret penetration tests such as SPT and CPT.

UNIT – II
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.
Learning Outcomes (Slope Stability)
After studying this topic, students will be able to:
1. Explain the concept of slope stability and distinguish between infinite and finite slopes.
2. Identify various types of slope failures (translational, rotational, and compound).
3. Calculate the factor of safety for infinite slopes under different conditions.
4. Analyze slope stability using Swedish slip circle method and method of slices.
5. Apply Bishop's Simplified method for more accurate slope stability evaluation.

UNIT – III
EARTH PRESSURE THEORIES: Active, Passive and at rest soil pressures Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory.
RETAINING WALLS: Types of retaining walls – stability of gravity and cantilever retaining walls against overturning, sliding and, bearing capacity, filter material for drainage.
Learning Outcomes
After studying this topic, students will be able to:
Earth Pressure Theories
1. Define and differentiate between active, passive, and at-rest earth pressures.

2. Apply Rankine's theory to compute earth pressures on retaining structures.
3. Analyze earth pressure distribution in layered soils.
5. Identify different types of retaining walls and their components.
6. Design suitable filter materials for effective drainage and stability.

UNIT – IV

SHALLOW FOUNDATIONS - Types - choice of foundation – location and depth - safe bearing capacity – shear criteria – Terzaghi's, and IS code methods - settlement criteria – allowable bearing pressure based on SPT N value and plate load test – allowable settlements of structures.

Learning Outcomes

After studying this topic, students will be able to:

1. Identify different types of shallow foundations and their applications.
2. Select the appropriate type, location, and depth of foundation based on site conditions.
3. Determine the safe bearing capacity of soil using shear failure criteria.
4. Apply Terzaghi's and IS code methods for bearing capacity evaluation

UNIT - V

PILE FOUNDATION: Types of piles – load carrying capacity of piles based on static pile formulae – dynamic pile formulae – Pile Capacity through SPT results - pile load tests - load carrying capacity of pile groups in sands and clays – Settlement of pile groups – negative skin friction

Learning Outcomes

After studying this topic, students will be able to:

1. Classify various types of piles based on function and material.
2. Determine the load carrying capacity of single piles using static formulae.
3. Apply dynamic pile formulae to estimate pile capacity during driving.
4. Correlate SPT results with pile bearing capacity for preliminary design.
5. Explain and interpret results of pile load tests (compression, tension, and lateral).

TEXT BOOKS:

1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt.Ltd, New Delhi.
2. Principals of Geotechnical Engineering by Braja M. Das, Cengage Learning Publishers.

REFERENCES:

1. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.
2. Geotechnical Engineering Principles and Practices by Cuduto, PHI International.
3. Analysis and Design of Substructures – Swami Saran, Oxford and IBH Publishing company Pvt.Ltd. (1998).
4. Geotechnical Engineering by S. K.Gulhati & Manoj Datta – Tata Mc.Graw Hill Publishing company New Delhi. 2005.
5. Bowles, J.E., (1988) Foundation Analysis and Design – 4th Edition, McGraw-Hill Publishing company, Newyork.

2480162 – GROUND IMPROVEMENT TECHNIQUES
(Professional Elective – VI)

B.Tech. IV Year II Sem **L T P C**
Prerequisites: Geo-Technical Engineering, Foundation Engineering **3 0 0 3**

Course Objectives:
1. To know the need of ground improvement
2. To acquire the knowledge on the various ground improvement techniques available and their applications for different types of soils
3. To understand suitable ground improvement technique for given soil conditions.

Course Outcomes: At the end of the course the students will be able to
1. Identify soil type and Know the necessity of ground improvement
2. Understand shallow and deep compaction techniques
3. Understand the various ground improvement techniques available
4. Apply physical and chemical modification
5. Select & design suitable ground improvement technique for existing soil conditions in the field

UNIT - I
Introduction to Engineering Ground Modification: Need and objectives, Identification of soil types, in situ and laboratory tests to characterize problematic soils; Mechanical, Hydraulic, Physico-chemical, Electrical, Thermal methods, and their applications.
Learning Outcomes
At the end of this unit, the student will be able to
1. Explain the need for ground modification.
2. Identify problematic soils.
3. Describe in-situ and lab tests for soil characterization.
4. Outline mechanical, hydraulic, physico-chemical, electrical, and thermal methods.

UNIT - II
Mechanical Modification: Shallow Compaction Techniques- Deep Compaction Techniques- Blasting- Vibrioception- Dynamic Tamping and Compaction piles.
Learning Outcomes
At the end of this unit, the student will be able to
1. Explain the purpose of mechanical soil modification.
2. Distinguish between shallow and deep compaction techniques.

UNIT - III
Hydraulic Modification: Objectives and techniques, traditional dewatering methods and their choice, Design of dewatering system, Electro-osmosis, Electro-kinetic dewatering-Filtration, Drainage and Seepage control with Geosynthetics, Preloading and vertical drains,
Learning Outcomes:
At the end of this unit, the student will be able to
State the objectives of hydraulic modification.
1. Describe dewatering techniques and their selection.
2. Explain design principles of dewatering systems.

UNIT - IV

Physical and Chemical Modification – Modification by admixtures, Modification Grouting, Introduction to Thermal Modification including freezing.

Learning Outcomes:

At the end of this unit, the student will be able to

1. Explain soil modification by admixtures (lime, cement, etc.).
2. Describe soil improvement by grouting techniques.
3. Outline thermal modification, including soil freezing.

UNIT – V

Modification by Inclusions and Confinement - Soil reinforcement, reinforcement with strip, and grid reinforced soil. In-situ ground reinforcement, ground anchors, rock bolting and soil nailing.

Learning Outcomes:

At the end of this unit, the student will be able to

1. Explain soil reinforcement and its purpose.
2. Describe strip and grid reinforced soils.
3. Outline in-situ ground reinforcement techniques.

TEXT BOOKS:

1. Hausmann, M. R. (1990) – Engineering Principles of Ground Modifications, McGraw Hill Publications.
2. M. P. Moseley and K. Krisch (2006) – Ground Improvement, II Edition, Taylor and Francis

REFERENCES:

1. Koerner, R. M (1994) – Designing with Geosynthetics – Prentice Hall, New Jersey
2. Jones C. J. F. P. (1985) – Earth Reinforcement and soil structures – Butterworths, London.
3. Xianthakos, Abreimson and Bruce - Ground Control and Improvement, John Wiley & Sons, 1994.
4. K. Krisch & F. Krisch (2010) - Ground Improvement by Deep Vibratory Methods, Spon Press, Taylor and Francis
5. Donald P Coduto – Foundation Design Principles and Practices, 2nd edition, Pearson, Indian edition, 2012.

2480163 – REPAIR AND REHABILITATION OF STRUCTURES
(Professional Elective – VI)

B.Tech. IV Year II Sem **L T P C**
Prerequisites: - **3 0 0 3**

Course Objectives:

To understand the various concepts of rehabilitation and retrofitting of structures

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

1. Develop various maintenance and repair strategies.
2. Understand corrosion of steel its causes and prevention
3. Assess damages by Non-Destructive Testing
4. Understand the common types of repairs and method of retrofitting
5. Understand and use the different techniques for structural retrofitting and health monitoring of structures

UNIT – I

Introduction – Deterioration of Structures – Distress in Structures – Causes and Prevention. Mechanism of Damage – Types of Damage

Learning Outcomes:

At the end of this unit, the student will be able to

- Explain the deterioration and distress in structures
- Analyze the causes and prevention of deterioration
- Classify damages

UNIT – II

Corrosion of Steel Reinforcement – Causes – Mechanism and Prevention. Damage of Structures due to Fire – Fire Rating of Structures – Phenomena of Desiccation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Analyze the causes and mechanism of steel reinforcement corrosion
- Understand the damage of structures due to fire

UNIT – III

Inspection and Testing – Symptoms and Diagnosis of Distress – Damage assessment – NDT.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the inspection and testing of distress
- Assess the damage by NDT techniques

UNIT – IV

Repair of Structure – Common Types of Repairs – Repair in Concrete Structures – Repairs in Under Water Structures – Guniting & Shotcrete – Underpinning.
Strengthening of Structures – Strengthening Methods – Retrofitting – Jacketing.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify the common types of repairs
- Assess the different strengthening of structures

UNIT – V

Health Monitoring of Structures – Use of Sensors – Building Instrumentation.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the health monitoring of structures
- Know the building instrumentation

TEXT BOOKS:

1. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.
2. Concrete Technology by A.R. Santa kumar, Oxford University press

REFERENCES:

1. Defects and Deterioration in Buildings, EF & N Spon, London
2. Non-Destructive Evaluation of Concrete Structures by Bungey – Surrey University Press
3. Concrete Repair and Maintenance Illustrated, RS Means Company Inc W.H.Ranso, (1981)
4. Building Failures: Diagnosis and Avoidance, EF & N Spon, London, B.A.Richardson, (1991).

2480164 – REMOTE SENSING AND GIS

(Professional Elective – VI)

B.Tech. IV Year II Sem **L T P C**

Prerequisites: Surveying **3 0 0 3**

Course Objectives: This course will make the student to understand about the principles of GIS, Remote Sensing, Spatial Systems, and its applications to Engineering Problems.

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

1. Retrieve the information content of remotely sensed data
2. Analyze the energy interactions in the atmosphere and earth surface features
3. Interpret the images for preparation of thematic maps
4. Apply problem specific remote sensing data for engineering applications
5. Analyze spatial and attribute data for solving spatial problems

UNIT – I

Introduction to Photogrammetry: Principles & types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducial points, parallax measurement using fiducial line.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Principles & types of aerial photograph
- Recognize the fundamentals of stereoscopy

UNIT – II

Remote Sensing: Basic concept of remote sensing, Data and Information, Remote sensing data Collection, Remote sensing advantages & Limitations, Remote Sensing process.

Electro-magnetic Spectrum, Energy interactions with atmosphere and with earth surface features (soil, water, vegetation), Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the basic concept of remote sensing
- Know the Indian Satellites and Sensors characteristics
- Identify the digital data, elements of visual interpretation techniques

UNIT – III

Geographic Information Systems: Introduction to GIS; Components of a GIS; Geospatial Data: Spatial Data-Attribute data – Joining Spatial and Attribute data; GIS Operations: Spatial Data Input-Attribute data Management –Data display- Data Exploration- Data Analysis. COORDINATE SYSTEMS: Geographic Coordinate System: Approximation of the Earth, Datum; Map Projections: Types of Map Projections-Map projection parameters- Commonly used Map Projections - Projected coordinate Systems

Learning Outcomes:
At the end of this unit, the student will be able to

- Know about GIS and components of a GIS
- Analyze the data
- Understand about Geographic Coordinate System

UNIT – IV
Vector Data Model: Representation of simple features- Topology and its importance; coverage and its data structure, Shape file; Data models for composite features Object Based Vector Data Model; Classes and their Relationship; The geobase data model; Geometric representation of Spatial Feature and data structure, Topology rules

Learning Outcomes:
At the end of this unit, the student will be able to

- Know about Topology and its importance
- Understand the data models

UNIT – V
Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data Conversion, Integration of Raster and Vector data.
Data Input: Metadata, Conversion of Existing data, creating new data; Remote Sensing data, Field data, Text data, Digitizing, Scanning, on screen digitizing, importance of source map, Data Editing

Learning Outcomes:
At the end of this unit, the student will be able to

- Know about raster data model
- Realize the data input methods

TEXT BOOKS:

1. Remote Sensing and GIS Lillesand and Kiefer, John Willey 2008.
2. Remote Sensing and GIS B. Bhatta by Oxford Publishers 2015.
3. Introduction to Geographic Information System – Kang-Tsung Chang, McGraw-Hill 2015

REFERENCES:

1. Concepts & Techniques of GIS by C. P. Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Principals of Geo physical Information Systems – Peter A Burragh and Rachael A.Mc Donnell, Oxford Publishers, 2004.
4. Basics of Remote sensing & GIS by S. Kumar, Laxmi Publications.