COURSE STRUCTURE (R23)
Civil Engineering (R23)

I - SEMESTER

S.No	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	23FE01	Communicative English	2	0	0	2	30	70	100
2	23FE03	Linear Algebra & Calculus	3	0	0	3	30	70	100
3	23FE04	Engineering Physics	3	0	0	3	30	70	100
4	23CM01	Basic Civil and Mechanical Engineering	3	0	0	3	30	70	100
5	23ME01	Engineering Graphics	2	0	2	3	30	70	100
Laboratory Courses									
6	23IT51	IT Workshop	0	0	2	1	30	70	100
7	23FE51	Communicative English Lab	0	0	2	1	30	70	100
8	23FE53	Engineering Physics Lab	0	0	2	1	30	70	100
9	23ME51	Engineering Workshop	0	0	3	1.5	30	70	100
10	23AU02	NSS/NCC/Scouts & Guides/Community Service	-	-	1	0.5	100	-	100
Total			**13**	**00**	**12**	**19**	**370**	**630**	**1000**

II - SEMESTER

S. No	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	23FE05	Differential Equations & Vector Calculus	3	0	0	3	30	70	100
2	23FE06	Engineering Chemistry	3	0	0	3	30	70	100
3	23EE01	Basic Electrical & Electronics Engineering	3	0	0	3	30	70	100
4	23CS01	Introduction to Programming	3	0	0	3	30	70	100
5	23ME02	Engineering Mechanics	3	0	0	3	30	70	100
Laboratory Courses									
6	23FE54	Engineering Chemistry Lab	0	0	2	1	30	70	100
7	23EE51	Electrical & Electronics Engineering Workshop	0	0	3	1.5	30	70	100
8	23CS51	Computer Programming Lab	0	0	3	1.5	30	70	100
9	23CE51	Engineering Mechanics and Building Practices Lab	0	0	3	1.5	30	70	100
10	23AU01	Health and wellness, Yoga and sports	-	-	1	0.5	100	-	100
Total			**15**	**00**	**12**	**21**	**370**	**630**	**1000**

III SEMESTER

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	23FE08	Numerical Techniques And Statistical Methods	3	0	0	3	30	70	100
2	23HS01	UHV 2 – understanding harmony and Ethical human conduct	2	1	0	3	30	70	100
3	23CE01	Surveying	3	0	0	3	30	70	100
4	23CE02	Strength of Materials	3	0	0	3	30	70	100
5	23CE03	Fluid Mechanics	3	0	0	3	30	70	100
Laboratory Courses									
6	23CE52	Surveying Lab	0	0	3	1.5	30	70	100
7	23CE53	Strength of Materials Lab	0	0	3	1.5	30	70	100
8	23CES1	Building Planning and Drawing	0	1	2	2	30	70	100
9	23MC01	Environmental Science	2	0	0	-	30	-	30
Total			**16**	**02**	**08**	**20**	**270**	**560**	**830**

IV SEMESTER

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	23HS02	Managerial Economics and Financial Analysis	2	0	0	2	30	70	100
2	23CE04	Engineering Geology	3	0	0	3	30	70	100
3	23CE05	Concrete Technology	3	0	0	3	30	70	100
4	23CE06	Structural Analysis	3	0	0	3	30	70	100
5	23CE07	Hydraulics & Hydraulic Machinery	3	0	0	3	30	70	100
Laboratory Courses									
6	23CE54	Concrete Technology Lab	0	0	3	1.5	30	70	100
7	23CE55	Engineering Geology lab	0	0	3	1.5	30	70	100
8	23CES2	Remote Sensing and Geographical Information Systems	0	1	2	2	30	70	100
9	23ME57	Design Thinking & Innovation	1	0	2	2	30	70	100
10	23MC02	Building materials and Construction	3	0	0	-	30	-	30
Total			**18**	**01**	**10**	**21**	**300**	**630**	**930**

COURSE STRUCTURE (R23)
Civil Engineering (R23)

V SEMESTER

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	23CE08	Design and Drawing of Reinforced Concrete Structures	3	0	0	3	30	70	100
2	23CE09	Engineering Hydrology	3	0	0	3	30	70	100
3	23CE10	Geotechnical Engineering -I	3	0	0	3	30	70	100
4		**PROGRAM ELECTIVE – I**	3	0	0	3	30	70	100
	23CE11	Advanced Structural Analysis							
	23CE12	Architecture and Town Planning					30	70	100
	23CE13	Construction Technology and Management					30	70	100
	23CE14	Safety Engineering					30	70	100
5		**OPEN ELECTIVE – I**	3	0	0	3	30	70	100
Laboratory Courses									
6	23CE56	Geotechnical Engineering Lab	0	0	3	1.5	30	70	100
7	23CE57	Hydraulics and Hydraulic Machinery Lab	0	0	3	1.5	30	70	100
8	23CES3	Estimation, Specifications and Contracts	0	1	2	2	30	70	100
9	23EM01	Tinkering Lab	0	0	2	1	30	70	100
10	23PI01	Evaluation of Community Service Internship	0	0	0	2	-	50	50
Total			**15**	**01**	**10**	**23**	**270**	**680**	**950**

VI SEMESTER

S.No	Course code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	23CE15	Design and Drawing of Steel Structures	3	0	0	3	30	70	100
2	23CE16	Highway Engineering	3	0	0	3	30	70	100
3	23CE17	Environmental Engineering	3	0	0	3	30	70	100
4		**PROGRAM ELECTIVE – II**	3	0	0	3	30	70	100
	23CE18	Ground Improvement Techniques							
	23CE19	Low-Cost and Eco-Friendly Building Techniques							
	23CE20	Repair and Rehabilitation of Structures							
	23CE21	Valuation and Quantity Survey							
5		**PROGRAM ELECTIVE – III**	3	0	0	3	30	70	100
	23CE22	Green Buildings							
	23CE23	Finite element method							
	23CE24	Bridge Engineering							
	23CE25	Water Resource Engineering							
6		**OPEN ELECTIVE – II**	3	0	0	3	30	70	100
Laboratory Courses									
7	23CE58	Environmental Engineering lab	0	0	3	1.5	30	70	100
8	23CE59	High Way Engineering lab	0	0	3	1.5	30	70	100
9	23CES4	CAD Lab / Soft skills course	0	1	2	2	30	70	100
10	23MC04	Technical Paper Writing & IPR	2	0	0	-	30	-	30
Total			**20**	**1**	**08**	**23**	**300**	**630**	**930**

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

OPEN ELECTIVES

Course Code	Course Name	Offered to the branches
23AD81	Introduction to Artificial Intelligence	ASE, CE, ECE,EEE & ME
23AD82	Fundamentals of Data Science	ASE, CE, ECE,EEE & ME
23AD83	Introduction to Cloud Computing	ASE, CE, ECE,EEE & ME
23AD84	Data Analytics	ASE, CE, ECE,EEE & ME
23AE81	PRINCIPLES OF FLIGHT	AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23AE82	SPACE SCIENCE	AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23AE83	AIRCRAFT INSTRUMENTATION	AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23AE84	AIR TRANSPORTATION SYSTEMS	AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23AM81	Python Programming for AI & ML	ASE, CE, ECE,EEE & ME
23AM82	AI in healthcare	ASE, CE, ECE,EEE & ME
23AM83	Fundamentals of Machine Learning	ASE, CE, ECE,EEE & ME
23AM84	Introduction to Deep learning	ASE, CE, ECE,EEE & ME
23CE81	Disaster Management	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE82	Climate change impact on Eco system	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE83	Environmental Sanitation	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE84	Introduction to Remote Sensing and GIS	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE85	Water Supply Systems	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CE86	Sustainability in Engineering Practices	ASE,AI&DS,CSE, CSE(AI&ML), ECE,EEE,IT & ME
23CS81	Introduction to Java Programming	ASE, CE, ECE,EEE & ME
23CS82	Principles of Operating Systems	ASE, CE, ECE,EEE & ME
23CS83	Principles of Database Management Systems	ASE, CE, ECE,EEE & ME
23CS83	Principles of Database Management Systems	ASE, CE, ECE,EEE & ME
23CS84	IoT based smart Systems	ASE, CE, ECE,EEE & ME
23EC81	Linear and Digital IC Applications	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME
23EC82	Principles of communications	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME
23EC83	Fundamentals of VLSI Design	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME
23EC84	Principles of Cellular & Mobile communications	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME
23EC85	Fundamentals of Satellite Communications	ASE,AI&DS, CE,CSE, CSE(AI&ML), EEE,IT & ME

LAKIREDDY BALI REDDY COLLEGE OF ENGINEERING (AUTONOMOUS)

Course Code	Course Name	Offered to the branches
23EE81	Basic Control System	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE82	Basic Electrical Measurements	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE83	Utilization of Electrical Energy	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE84	Electric Vehicles	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE85	Concepts of Energy Auditing & Management	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23EE86	Electrical Wiring Estimation and Costing	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,IT & ME
23IT81	Computer System Architecture	ASE, CE, ECE,EEE & ME
23IT82	Introduction to Programming in Java	ASE, CE, ECE,EEE & ME
23IT83	Principles of Software Engineering	ASE, CE, ECE,EEE & ME
23ME81	Sustainable Energy Technologies	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME82	Introduction to Industrial Robotics	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME83	Applied Operations Research	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME84	Entrepreneurship	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME85	Additive Manufacturing	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT
23ME86	Vehicle Technology	ASE,AI&DS, CE,CSE, CSE(AI&ML), ECE,EEE & IT

B.Tech. (I Sem.) **23FE01 - COMMUNICATIVE ENGLISH**

L	T	P	Cr.
2	0	0	2

Course Objectives:

The main objective of introducing this course, *Communicative English,* is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students to make them effective in speaking and writing skills and to make them industry ready.

Course Outcomes:

CO1: Understand the context, topic, and pieces of specific information from social or transactional dialogues **(Understand)**

CO2: Apply grammatical structures to formulate sentences and correct word forms. **(Apply)**

CO3: Use discourse markers to speak clearly on a specific topic in informal discussions. **(Apply)**

CO4: Read / Listen the texts and write summaries based on global comprehension of these texts. **(Understand)**

CO5: Prepare a coherent paragraph, essay, and resume. **(Apply)**

UNIT I

Lesson: HUMAN VALUES: Gift of Magi **(Short Story)**

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.
Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.
Grammar: Parts of Speech, Basic Sentence Structures-forming questions
Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

UNIT II

Lesson: NATURE: The Brook by Alfred Tennyson (Poem)

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Writing: Structure of a paragraph - Paragraph writing (specific topics)
Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions.
Vocabulary: Homonyms, Homophones, Homographs.

UNIT III

Lesson: BIOGRAPHY: Elon Musk

Listening: Listening for global comprehension and summarizing what is listened to.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed
Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.
Writing: Summarizing, Note-making, paraphrasing
Grammar: Verbs - tenses; subject-verb agreement; Compound words, Collocations
Vocabulary: Compound words, Collocations

UNIT IV

Lesson: INSPIRATION: The Toys of Peace by Saki

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.
Writing: Letter Writing: Official Letters, Resumes

Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice
Vocabulary: Words often confused, Jargons

UNIT V

Lesson: MOTIVATION: The Power of Intrapersonal Communication (An Essay)

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.
Speaking: Formal oral presentations on topics from academic contexts
Reading: Reading comprehension.
Writing: Writing structured essays on specific topics.
Grammar: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Vocabulary: Technical Jargons

TEXTBOOKS:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient Black Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

REFERENCE BOOKS:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge University Press, 2019.

Web Resources:

GRAMMAR:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

B.Tech. (I Sem.)

23FE03 - LINEAR ALGEBRA & CALCULUS

L	T	P	Cr.
3	0	0	3

Course Objectives:

To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

CO1: Apply matrix algebra techniques to solve engineering problems. **(Apply)**
CO2: Use Eigen values and Eigen vectors concept to find nature of quadratic form, inverse and powers of matrix. **(Apply)**
CO3: Expand various functions using Mean value theorems. **(Understand)**
CO4: Understand the concepts of functions of several variables which are useful in optimization. **(Understand)**
CO5: Evaluate areas and volumes by using double and triple integrals. **(Apply)**

UNIT I Matrices

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

UNIT II Eigenvalues, Eigenvectors and Orthogonal Transformation

Eigenvalues, Eigenvectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT III Calculus

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT IV Partial differentiation and Applications (Multi variable calculus)

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Directional derivative, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V Multiple Integrals (Multi variable Calculus)

Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

TEXTBOOKS:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

REFERENCE BOOKS:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition(9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, , Pearson publishers, 9th edition
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications,2014, Third Edition (Reprint 2021)

B.Tech. (I Sem.)	23FE04 - ENGINEERING PHYSICS	L	T	P	Cr.
		3	0	0	3

Course Objectives:

To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

Course Outcomes:

CO1: Analyze the intensity variation of light due to interference, diffraction, and Polarization (**Apply**).

CO2: Understand the basics of crystals and their structures (**Understand**).

CO3: Summarize various types of polarization of dielectrics and classify the magnetic materials (**Understand**)

CO4: Explain fundamentals of quantum mechanics and free electron theory of metals (**Understand**).

CO5: Identify the type of semiconductor using Hall Effect (**Apply**).

UNIT I Wave Optics

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative). Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT II Crystallography and X-ray diffraction

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X-ray diffraction: Bragg's law - X-ray Diffractometer – crystal structure determination by Laue's and powder methods

UNIT III Dielectric and Magnetic Materials

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro, anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT IV Quantum Mechanics and Free electron Theory

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

UNIT V Semiconductors

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation – Hall effect and its applications.

TEXTBOOKS:

1. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

REFERENCE BOOKS:

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning 2021.
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press. 2010
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

Web Resources: https://www.loc.gov/rr/scitech/selected-internet/physics.html

B.Tech. (I Sem.)	23CM01 - BASIC CIVIL AND MECHANICAL ENGINEERING	L	T	P	Cr.
		3	0	0	3

PART A: BASIC CIVIL ENGINEERING

Course Objectives:

- Get familiarized with the scope and importance of Civil Engineering sub-divisions.
- Introduce the preliminary concepts of surveying.
- Acquire preliminary knowledge on Transportation and its importance in nation's economy.
- Get familiarized with the importance of quality, conveyance and storage of water.
- Introduction to basic civil engineering materials and construction techniques.

Course Outcomes: On completion of the course, the student should be able to:

CO1: Describe various sub-divisions of Civil Engineering and to appreciate their role in societal development. **(Understand)**

CO2: Outline the concepts of surveying and obtain the theoretical measurement of distances, angles and levels through surveying. **(Understand)**

CO3: Classify the various materials used in construction and highway engineering and identify their appropriate usage as per the needs. **(Understand)**

CO4: Illustrate the fundamental principles involved in transportation network system, their individual components and their engineering importance. **(Understand)**

CO5: Explain the quality parameters of various water sources and functions of selected water storage and conveyance structures. **(Understand)**

UNIT I

Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-technical Engineering- Transportation Engineering

- Hydraulics and Water Resources Engineering - Environmental Engineering-Scope of each discipline - Building Construction and Planning- Construction Materials-Cement - Aggregate -Bricks- Cement concrete- Steel. Introduction to Prefabricated construction Techniques.

UNIT II

Surveying: Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Levelling instruments used for levelling -Simple problems on levellingand bearings-Contour mapping.

UNIT III

Transportation Engineering Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering.

Water Resources and Environmental Engineering: Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage andConveyance Structures (Simple introduction to Dams and Reservoirs).

TEXTBOOKS:

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt.Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers.2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

REFERENCE BOOKS:

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. FifthEdition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016
3. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi 2023. 38th Edition.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand andBrothers Publications 2019. 10th Edition.
5. Indian Standard DRINKING WATER — SPECIFICATION IS 10500-2012.

PART B: BASIC MECHANICAL ENGINEERING

Course Objectives: The students after completing the course are expected to

- Get familiarized with the scope and importance of Mechanical Engineering in differentsectors and industries.
- Explain different engineering materials and different manufacturing processes.
- Provide an overview of different thermal and mechanical transmission systems andintroduce basics of robotics and its applications.

Course Outcomes: On completion of the course, the student should be able to

CO1: Summarize the different manufacturing processes. (**Remember**)

CO2: Explain the basics of thermal engineering and its applications. (**Understand**)

CO3: Illustrate the working of different mechanical power transmission systems and power plants.(**Understand**)

CO4: Describe the basics of robotics and its applications. (**Understand**)

UNIT I

Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society- Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

UNIT II

Manufacturing Processes: Principles of Casting**,** Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – Working principle of Boilers, Otto cycle, Diesel cycle, Refrigerationand air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

UNIT III

Power plants – Working principle of Steam, Diesel, Hydro, Nuclear power plants.
Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and theirapplications.

Introduction to Robotics - Joints & links, configurations, and applications of robotics.

(Note: The subject covers only the basic principles of Civil and Mechanical Engineeringsystems. The evaluation shall be intended to test only the fundamentals of the subject.)

TEXTBOOKS:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India)Pvt. Ltd.
2. A text book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications,(India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengagelearning India Pvt. Ltd.

REFERENCE BOOKS:

1. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, TataMcGraw Hill publications (India) Pvt. Ltd.
2. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt.Ltd.
3. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak MPandey, Springer publications
4. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I

B.Tech. (I Sem.)

23ME01 - ENGINEERING GRAPHICS

L	T	P	Cr.
2	0	2	3

Course Objectives:

- To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
- To impart knowledge on the projection of points, lines and plane surfaces
- To improve the visualization skills for better understanding of projection of solids
- To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
- To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

Course Outcomes:

CO1: Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections. (**Understand**)

CO2: Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views. (**Apply**)

CO3: Understand and draw projection of solids in various positions in first quadrant. (**Apply**)

CO4: Able to draw the development of surfaces of simple objects (**Apply**)

CO5: Prepare isometric and orthographic sections of simple solids. (**Apply**)

UNIT I

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods. **(Covered theoretically in class. Not for the end examination)**

Scales: Plain scales, diagonal scales and vernier scales. **(Covered theoretically in class. Not for the end examination)**

Curves: Construction of ellipse, parabola and hyperbola by general method only, Cycloids, Involutes, Normal and tangent to Curves.

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

UNIT II

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes. **Projections of Planes:** Regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane.

UNIT III

Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane

and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

UNIT IV

Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

UNIT V

Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD **(*Not for end examination*).**

TEXTBOOK:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

REFERENCE BOOKS:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.
2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.
3. Engineering Drawing with an Introduction to AutoCAD, DhananjayJolhe, Tata McGraw Hill, 2017.

B.Tech. (I Sem.)

23IT51 - IT WORKSHOP

L	T	P	Cr.
0	0	1	1

Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

Course Outcomes:

CO1: Identify the components of a PC and troubleshooting the malfunctioning of PC.**(Apply)**
CO2: Develop presentation /documentation using Office tools and LaTeX. **(Apply)**
CO3: Build dialogs and documents using ChatGPT. **(Apply)**
CO4: Improve individual / teamwork skills, communication and report writing skills with ethical values.

PC Hardware & Software Installation

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and WORD

Task 1 – Word Orientation: The mentor needs to give an overview of La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using La TeXand word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using La TeX and Word to create a project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both La TeX and Word.

Task 3: Creating project abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

EXCEL

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

LOOKUP/VLOOKUP

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

POWER POINT

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI TOOLS – ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

- Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"
- **Task 2:** Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas
- Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

- Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

REFERENCE BOOKS:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
4. PC Hardware - A Handbook, Kate J. Chase, PHI (Microsoft)
5. LaTeX Companion, Leslie Lamport, PHI/Pearson.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan– CISCO Press, Pearson Education, 3rd edition

B.Tech. (I Sem.) **23FE51 - COMMUNICATIVE ENGLISH LAB**

L	T	P	Cr.
0	0	2	1

Course Objectives:

The main objective of introducing this course, Communicative English Laboratory, is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

Course Outcomes:

CO1: Understand the different aspect of the English language proficiency with emphasis on LSRW skills. **(Understand)**
CO2: Apply Communication Skills through various language learning activities. **(Apply)**
CO3: Identifying the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking, comprehension. **(Understand)**
CO4: Exhibit professionalism in participating in debates and group discussions. **(Apply)**

List of Topics:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. E-mail Writing
6. Resume Writing, Cover letter, SOP
7. Group Discussions-methods & practice
8. Debates - Methods & Practice
9. PPT Presentations/ Poster Presentation
10. Interviews Skills

Suggested Software:

1. Walden Infotech
2. Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta-Sharma. *Technical Communication*. Oxford Press.2018.
2. Taylor Grant: *English Conversation Practice*, Tata McGraw-Hill Education India, 2016
3. Hewing's, Martin. Cambridge *Academic English* (B2). CUP, 2012.
4. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2nd Ed), Kindle, 2013

Web Resources:

Spoken English:

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net

4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw

Voice & Accent:

1. https://www.youtube.com/user/letstalkaccent/videos
2. https://www.youtube.com/c/EngLanguageClub/featured
3. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

L	T	P	Cr.
0	0	2	1

B.Tech. (I Sem.)

23FE53 - ENGINEERING PHYSICS LAB

Course Objectives:

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

Course Outcomes: The students will be able to

CO1: Analyze the wave properties of light using optical instruments (**Apply**).
CO2: Estimate the elastic modulii of various materials and acceleration due to gravity (**Apply**).
CO3: Demonstrate the vibrations in stretched strings (**Understand**).
CO4: Evaluate dielectric constant and magnetic field of circular coil carrying current (**Apply**).
CO5: Examine the characteristics of semiconductor devices (**Apply**).

List of Experiments:

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
11. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall effect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non- uniform bending (or double cantilever) method.
18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

REFERENCES:

- A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.

Web Resources

- www.vlab.co.in
- https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

B.Tech. (I Sem.) **23ME51 - ENGINEERING WORKSHOP**

L	T	P	Cr.
0	0	3	1.5

Course Objectives:

To familiarize students with wood working, sheet metal operations, fitting, electrical house wiring skills, and basic repairs of two-wheeler vehicle.

Course Outcomes:

CO1: Identify workshop tools and their operational capabilities. (**Remember**)

CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, and welding. (**Understand**)

CO3: Modal various basic prototypes in fitting trade. (**Apply**)

CO4: Apply basic electrical engineering knowledge for House Wiring Practice (**Apply**)

SYLLABUS

1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
   a. Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
   a. Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   a. V-fit b) Dovetail fit c) Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.
   a. Parallel and series b) Two-way switch c) Godown lighting
   d) Tube light e) Three phase motor f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.
9. **Basic repairs of Two-wheeler vehicle** – Demonstration of working of two-wheeler vehicle and its repairs.

TEXTBOOKS:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

REFERENCE BOOKS:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22

B.Tech. (I Sem.)	23AU02 - NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE	L	T	P	Cr.
		-	-	1	0.5

Course Objectives:

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

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

CO1: Understand the importance of discipline, character and service motto. **(Understand)**
CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques. **(Apply)**
CO3: Explore human relationships by analyzing social problems. **(Understand)**
CO4: Determine to extend their help for the fellow beings and downtrodden people **(Apply)**
CO5: Develop leadership skills and civic responsibilities. **(Apply)**

UNIT I Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II Nature & Care Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition.
iv) Organising Zero-waste day.
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.
vii) Write a summary on any book related to environmental issues.

UNIT III Community Service Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities-experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc.
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme* Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

B.Tech. (II Sem.)	23FE05 - DIFFERENTIAL EQUATIONS & VECTOR CALCULUS	L	T	P	Cr.
		3	0	0	3

Course Objectives:

- To enlighten the learners in the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications.

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

CO1	Solve the differential equations related to various engineering fields (Unit – I&II)	**Apply**
CO2	Apply knowledge of partial differentiation in modelling and solving of Partial differential equations.	**Apply**
CO3	Interpret the physical meaning of different operators such as gradient, curl and divergence.	**Apply**
CO4	Evaluate the work done against a field, circulation and flux using Vector Calculus.	**Apply**

UNIT I Differential equations of first order and first degree

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

UNIT II Linear differential equations of higher order (Constant Coefficients)

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

UNIT III Partial Differential Equations

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

UNIT IV Vector differentiation

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions-Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT V Vector integration

LWithoutegral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

TEXTBOOKS:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition

2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley & Sons, 2018, 10th Edition.

REFERENCE BOOKS:

1. Thomas Calculus, George B. Thomas, Maurice D. Weir and Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, Dennis G. Zill and Warren S. Wright, Jones and Bartlett, 2018.
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, R. K. Jain and S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
5. Higher Engineering Mathematics, B. V. Ramana, , McGraw Hill Education, 2017

B.Tech. (II Sem.) **23FE06 - ENGINEERING CHEMISTRY**

L	T	P	Cr.
3	0	0	3

Course Objectives:

- To enable the students to understand the fundamental concepts of chemistry and to provide them with the knowledge of industrial problems and finding the solutions.
- To understand quality of water, fuels for various applications, polymers, electrochemistry and batteries.
- To learn the basic concepts of surface chemistry and identify the significance of modern engineering materials.

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

CO1: Identify the troubles due to hardness of water and its maintenance in industrial applications. (**Understand**)

CO2: Apply Nernst equation in calculating cell potentials, compare batteries for different applications and outline the principles of corrosion for design and effective maintenance of various devices. (**Understand**)

CO3: Outline the importance of polymers and alternate fuels. (**Understand**)

CO4: Summarize the suitability of engineering materials like composites, refractories, lubricants, and building materials. (**Understand**)

CO5: Understand the concepts of collides, micelles and nanomaterials. (**Understand**)

UNIT I Water Technology

Soft and hardwater, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen - Boiler troubles –Priming, foaming**,** scale and sludge, Caustic embrittlement, Industrial water treatment – Specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, Ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

UNIT II Electrochemistry and Applications

Electrodes –electrochemical cell, Nernst equation, cell potential calculations.

Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad),and lithium ion batteries- working principle of the batteries including cell reactions; Fuel cells-Basic Concepts, the principle and working of hydrogen-oxygen Fuel cell.

Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion**,** cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).

UNIT III Polymers and Fuel Chemistry

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization.

Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of poly styrene. PVC Nylon 6,6 and Bakelite.

Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol rubbers.

Fuels – Types of fuels, calorific value of fuels, numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane and Cetane number- alternative fuels- propane, methanol, ethanol and bio fuel-bio diesel.

UNIT IV Modern Engineering Materials

Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications

Refractories- Classification, Properties, Factors affecting the refractory materials and Applications.

Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils – Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and Applications.

Building materials- Portland Cement, constituents, Setting and Hardening of cement.

UNIT V Surface Chemistry and Nanomaterials

Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, synthesis of colloids (Braggs Method), chemical and biological methods of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, adsorption isotherm (Freundlich and Longmuir), BET equation (no derivation) applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.

TEXTBOOKS:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

REFERENCE BOOKS:

1. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman, 1992.
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

B.Tech. (II Sem.)	23EE01 - BASIC ELECTRICAL & ELECTRONICS ENGINEERING	L	T	P	Cr.
		3	0	0	3

Course Objectives

To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

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

CO1: Extract electrical variables of AC & DC circuits using fundamental laws. **(Understand)**
CO2: Understand the operation of electrical machines and measuring instruments. **(Understand)**
CO3: Classify various energy resources, safety measures and interpret electricity bill generation in electrical systems. **(Understand)**

PART A: BASIC ELECTRICAL ENGINEERING

UNIT I DC & AC Circuits

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

UNIT II Machines and Measuring Instruments

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

UNIT III Energy Resources, Electricity Bill & Safety Measures

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various Power Generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

TEXTBOOKS:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

REFERENCE BOOKS:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Principles of Power Systems, V.K. Mehtha, S.Chand Technical Publishers, 2020
3. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017
4. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Person Publications, 2018, Second Edition.

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076

PART B: BASIC ELECTRONICS ENGINEERING

Course Objectives:

- To teach the fundamentals of semiconductor devices and its applications, principles of digital electronics.

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

CO4: Interpret the characteristics of various semiconductor devices **(Knowledge)**
CO5: Infer the operation of rectifiers, amplifiers. **(Understand)**
CO6: Contrast various logic gates, sequential and combinational logic circuits. **(Understand)**

UNIT I SEMICONDUCTOR DEVICES

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode — Zener Effect — Zener Diode and its Characteristics. Bipolar Junction Transistor — CB, CE, CC Configurations and Characteristics — Elementary Treatment of Small Signal CE Amplifier.

UNIT II BASIC ELECTRONIC CIRCUITS AND INSTRUMENTTAION

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. Amplifiers: Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. Electronic Instrumentation: Block diagram of an electronic instrumentation system.

UNIT III DIGITAL ELECTRONICS

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

TEXTBOOKS:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

REFERENCE BOOKS:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

End examination pattern:

i) Question paper shall be in two parts viz., Part A and Part B with equal weightage of 35 marks each.
ii) In each part, question 1 shall contain 5 compulsory short answer questions for a total of 5 marks such that each question carries 1 mark.
iii) In each part, questions from 2 to 4, there shall be either/or type questions of 10 marks each. Student shall answer any one of them.
iv) The questions from 2 to 4 shall be set by covering one unit of the syllabus for each question.

B.Tech. (II Sem.) **23CS01 - INTRODUCTION TO PROGRAMMING**

L	T	P	Cr.
3	0	0	3

Course Objectives:

- To introduce students to the fundamentals of computer programming.
- To provide hands-on experience with coding and debugging.
- To foster logical thinking and problem-solving skills using programming.
- To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
- To encourage collaborative learning and teamwork in coding projects.

Course Outcomes: A student after completion of the course will be able to

CO1: Understand basics of computers, concept of algorithms and flowcharts. (**Understand)**

CO2: Understand the features of C language. (**Understand**)

CO3: Interpret the problem and develop an algorithm to solve it. (**Apply**)

CO4: Implement various algorithms using the C programming language. (**Apply**)

CO5: Develop skills required for problem-solving and optimizing the code (**Apply)**

UNIT I Introduction to Programming and Problem Solving

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program-Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting.

Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

UNIT II Control Structures

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

UNIT III Arrays and Strings

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

UNIT IV Pointers & User Defined Data types

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

UNIT V Functions & File Handling

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling

Note: The syllabus is designed with C Language as the fundamental language of implementation**.**

TEXTBOOKS:

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988
2. Schaum's Outline of Programming with C, Byron S Gottfried, McGraw-Hill Education, 1996

REFERENCE BOOKS:

1. Computing fundamentals and C Programming, Balagurusamy, E., McGraw-Hill Education, 2008.
2. Programming in C, Rema Theraja, Oxford, 2016, 2nd edition
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition

B.Tech. (II Sem.) **23ME02 - ENGINEERING MECHANICS**

L	T	P	Cr.
3	0	0	3

Course Objectives:

- To get familiarized with different types of force systems.
- To draw accurate free body diagrams representing forces and moments acting on a body to analyze the equilibrium of system of forces.
- To teach the basic principles of center of gravity, centroid and moment of inertia and determine them for different simple and composite bodies.
- To apply the Work-Energy method to particle motion.
- To understand the kinematics and kinetics of translational and rotational motion of rigid bodies.

Course Outcomes: On Completion of the course, the student should be able to

CO1: Determine the resultant of coplanar concurrent and non-concurrent force systems (**Apply**)

CO2: Apply static equilibrium conditions to determine unknown planar force systems and determine the frictional forces for bodies in contact. (**Apply**)

CO3: Calculate the centroids, center of gravity and moment of inertia of different geometrical shapes. (**Apply**)

CO4: Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle. (**Apply**)

CO5: Solve the problems involving the translational and rotational motion of rigid bodies. (**Apply**)

UNIT I

Introduction to Engineering Mechanics– Introduction, Basic Terminology in mechanics, Laws of mechanics, Characteristics of forces, resolution & composition of forces.

Systems of Forces: Coplanar Concurrent Forces– Coplanar Non-Concurrent Forces, moment of force, applications- Couples and Resultant of Force Systems.

UNIT II

Equilibrium of Systems of Forces: Free Body Diagrams, Lami's Theorem, Equations of Equilibrium of Coplanar Systems, Triangle law of forces, polygon law of forces condition of equilibrium, Analysis of plane trusses, Principle of virtual work with simple examples.

Friction: Introduction, Coulomb's laws of dry friction, coefficient of friction, Cone of Static friction, limiting friction and impending motion of blocks resting on horizontal and inclined planes,.

UNIT III

Centroid: Centroids of simple figures (from basic principles)–Centroids of I, T, C, L Sections.

Centre of Gravity: Centre of gravity of simple bodies (from basic principles).

Area Moments of Inertia: Definition, Moment of inertia of I, T, C, L Sections– Polar Moment of Inertia, Transfer Theorem.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia for simple objects.

UNIT IV

Rectilinear and Curvilinear motion of a particle: Introduction to Kinematics and Kinetics, General principles in dynamics, Rectilinear and curvilinear motions- motion with uniform velocity, uniform acceleration and non-uniform acceleration – D'Alembert's Principle - Work Energy method and applications to particle motion-Impulse Momentum method (theory only).

UNIT V

Rigid body Motion: Kinematics and Kinetics of rigid bodies in translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method and simple applications.

TEXTBOOKS:

1. Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., McGraw Hill Education 2017. 5th Edition.
2. Engineering Mechanics, P.C.Dumir- S.Sengupta and Srinivas V veeravalli , University press. 2020. First Edition.
3. A Textbook of Engineering Mechanics, S.S Bhavikatti. New age international publications 2018. 4th Edition.

REFERENCE BOOKS:

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education. 2017. First Edition.
2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., PHI, 2002. 4th Edition.
3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L. G. Kraige., John Wiley, 2008. 6th Edition.
4. Introduction to Statics and Dynamics, Basudev Battachatia, Oxford University Press, 2014. Second Edition
5. Engineering Mechanics: Statics and Dynamics, Hibbeler R.C., Pearson Education, Inc., New Delhi, 2022, 14th Edition

L	T	P	Cr.
0	0	2	1

B.Tech. (II Sem.) **23FE54 - ENGINEERING CHEMISTRY LAB**

Course Objectives:

- To enable the students to analyze water samples and perform different types of volumetric titrations.
- To provides an overview of preparation of polymers, nanomaterials and analytical techniques.
- To measure the important parameters of fuels, lubricants and composition of cement.

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

CO1: Analyze important parameters of water to check its suitability for drinking purposes and industrial applications. **(Analyze)**

CO2: Acquire practical knowledge related to preparation of Bakelite and nanomaterials. **(Apply)**

CO3: Distinguish different types of titrations in volumetric analysis after performing the experiments listed in the syllabus. **(Apply)**

CO4: To estimate the amount of calcium in cement and the strength of acid present in Pb-Acid battery. **(Apply)**

CO5: Improve individual / teamwork skills, communication and report writing skills with ethical values. **(Apply)**

List of Experiments:

1. Determination of Hardness of a groundwater sample.
2. Estimation of Dissolved Oxygen by Winkler's method
3. Determination of Strength of an acid in Pb-Acid battery
4. Preparation of a polymer (Bakelite)
5. Determination of percentage of Iron in Cement sample by colorimetry
6. Estimation of Calcium in port land Cement
7. Preparation of nanomaterials by precipitation method.
8. Adsorption of acetic acid by charcoal
9. Determination of percentage Moisture content in a coal sample
10. Determination of Viscosity of lubricating oil by Redwood Viscometer 1
11. Determination of Viscosity of lubricating oil by Redwood Viscometer 2
12. Determination of Calorific value of gases by Junker's gas Calorimeter

REFERENCE:

- "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar

B.Tech. (II Sem.)	23EE51 - ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP	L	T	P	Cr.
		0	0	3	1.5

Course Objectives:

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

Course Outcomes: After competition of this course, the student will be able to
CO1. Compute voltage, current and power in an electrical circuit. **(Apply)**
CO2. Compute medium resistance using Wheat stone bridge. **(Apply)**
CO3. Discover critical field resistance and critical speed of DC shunt generators. **(Apply)**
CO4. Estimate reactive power and power factor in electrical loads. **(Understand)**
CO5: Plot the characteristics of semiconductor devices. **(Apply)**
CO6: Demonstrate the working of various logic gates using ICs. **(Understand)**

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
   - Provide some exercises so that hardware tools and instruments are learned to be used by the students.

2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
   - Provide some exercises so that measuring instruments are learned to be used by the students.

3. Components:
   - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.

   - Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

PART A: ELECTRICAL ENGINEERING LAB

List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

Reference Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Note: Minimum Six Experiments to be performed.

PART B: ELECTRONICS ENGINEERING LAB

Course Objectives:

- To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

REFERENCES:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, PearsonEducation, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

Note: Minimum Six Experiments to be performed. All the experiments shall be implemented using both Hardware and Software.

L	T	P	Cr.
0	0	3	1.5

B.Tech. (II Sem.) **23CS51 - COMPUTER PROGRAMMING LAB**

Course Objectives:

The course aims to give students hands – on experience and train them on the concepts of the C- programming language.

Course Outcomes:

CO1: Read, understand, and trace the execution of programs written in C language. (**Understand)**

CO2: Apply the right control structure for solving the problem. (**Apply**)

CO3: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, pointers and files in C. (**Apply**)

CO4: Improve individual / teamwork skills, communication and report writing skills with ethical values.

UNIT I

Week 1

Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using Computers.

Lab1: Familiarization with programming environment

i) Basic Linux environment and its editors like Vi, Vim & Emacs etc
ii) Exposure to Turbo C, gcc
iii) Writing simple programs using printf(), scanf()

Week 2

Objective: Getting familiar with how to formally describe a solution to a problem in a seriesof finite steps both using textual notation and graphic notation.

Suggested Experiments /Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts.

Lab 1: Converting algorithms/flow charts into C Source code.

Developing the algorithms/flowcharts for the following sample programs

i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

Week 3

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions.

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae

iv) Distance travelled by an object

UNIT II

Week 4

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4: Simple computational problems using the operator' precedence and associativity

i) Evaluate the following expressions.
   a. A+B*C+(D*E) + F*G
   b. A/B*C-B+A*D/3
   c. A+++B---A
   d. J= (i++) + (++i)
ii) Find the maximum of three numbers using conditional operator
iii) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5

Objective: Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

i) Write a C program to find the max and min of four numbers using if-else.
ii) Write a C program to generate electricity bill.
iii) Find the roots of the quadratic equation.
iv) Write a C program to simulate a calculator using switch case.
v) Write a C program to find the given year is a leap year or not.

WEEK 6

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop.
ii) Find the given number is a prime or not.
iii) Compute sine and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers.

UNIT III

Week 7

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7:1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array.
ii) Perform linear search on1D array.
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number.
v) Eliminate duplicate elements in an array.

WEEK 8:

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

UNIT IV

Week 9

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details along with the total.
v) Write a C program to implement realloc()

WEEK 10:

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:

Tutorial 10: Bitfields, Self-Referential Structures, Linked lists

Lab10 : Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit- fields

i) Create and display a singly linked list using self-referential structure.
ii) Demonstrate the differences between structures and unions using a C program.
iii) Write a C program to shift/rotate using bitfields.
iv) Write a C program to copy one structure variable to another structure of the same type.

UNIT V

Week 11

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent,

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

i) Write a C function to calculate NCR value.
ii) Write a C function to find the length of a string.
iii) Write a C function to transpose of a matrix.
iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 12:

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

i) Write a recursive function to generate Fibonacci series.
ii) Write a recursive function to find the lcm of two numbers.
iii) Write a recursive function to find the factorial of a number.
iv) Write a C Program to implement Ackermann function using recursion.
v) Write a recursive function to find the sum of series.

WEEK 13:

Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

i) Write a C program to swap two numbers using call by reference.
ii) Demonstrate Dangling pointer problem using a C program.
iii) Write a C program to copy one string into another using pointer.

iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

WEEK14:

Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

i) Write a C program to write and read text into a file.
ii) Write a C program to write and read text into a binary file using fread() and fwrite()
iii) Copy the contents of one file to another file.
iv) Write a C program to merge two files into the third file using command-line arguments.
v) Find no. of lines, words and characters in a file
vi) Write a C program to print last n characters of a given file.

TEXTBOOKS:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum' s Outline of Programming with C, McGraw Hill

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice- Hall of India
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

B.Tech. (II Sem.)	23CE51 - ENGINEERING MECHANICS AND BUILDING PRACTICES LAB	L	T	P	Cr.
		0	0	3	1.5

Course Objectives: The students completing the course are expected to

- Understand the layout of a building, concepts of Non-Destructive Testing and different Alternative Materials.
- Verify the Law of Parallelogram of Forces and Lami's theorem.
- Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina.

Course Outcomes: On completion of the course, the student should be able to:

Course Outcomes: On completion of the course, the student should be able to:

CO1: Illustrate the purpose and working of various tools and materials used in Civil Engineering practice (**Understand**).

CO2: Demonstrate the plumbing and safety practices adopted in construction industry and documentation aspects of quality testing of civil engineering materials (**Understand**).

CO3: Verify the fundamentals involved in the applications of engineering mechanics (**Apply**)

Students have to perform any 10 of the following Experiments:

PART-A

1. To study various types of tools used in construction.
2. Study of Alternative Materials like M-sand, Fly ash, Sea Sand etc.
3. Field-Visit to understand the Quality Testing - report.
4. Safety Practices in Construction industry
5. Demonstration of Non-Destructive Testing - using Rebound Hammer & UPV
6. Study of Plumbing in buildings.

PART-B

1. Forces in Pin Jointed Trusses
2. Experimental Proof of Lami's Theorem
3. Verification of Law of Parallelogram of Forces.
4. Determination of Centre of Gravity of different shaped Plane Lamina.
5. Determination of coefficient of Static and Rolling Friction.
6. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever

B.Tech. (II Sem.)	23AU01 - HEALTH AND WELLNESS, YOGA AND SPORTS	L	T	P	Cr.
		-	-	1	0.5

Course Objectives:

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

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

CO1: Understand the importance of yoga and sports for Physical fitness and sound health. **(Understand)**

CO2: Demonstrate an understanding of health-related fitness components. **(Apply)**

CO3: Compare and contrast various activities that help enhance their health. **(Understand)**

CO4: Assess current personal fitness levels. **(Apply)**

CO5: Develop Positive Personality **(Apply)**

UNIT I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community
ii) Preparation of health profile
iii) Preparation of chart for balance diet for all age groups

UNIT II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.
   Practicing general and specific warm up, aerobics
ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022

2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

B.Tech. (III Sem.)	23FE08 - NUMERICAL TECHNIQUES AND STATISTICAL METHODS	L	T	P	Cr.
		3	0	0	3

Course Objectives:

1. To elucidate the different numerical methods to solve nonlinear algebraic equations.
2. To disseminate the use of different numerical techniques for carrying out numerical integration.
3. To familiarize the students with the foundations of probability and statistical methods.
4. To equip the students to solve application problems in their disciplines.

Course Outcomes:

CO1: Evaluate the approximate roots of polynomial and transcendental equations by different algorithms. Apply Newton's forward & backward interpolation and Lagrange's formulae for equal and unequal intervals **(L3)**

CO2: Apply numerical integral techniques to different Engineering problems. Apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations **(L3)**

CO3: Apply discrete and continuous probability distributions **(L3)**

CO4: Design the components of a classical hypothesis test **(L4)**

CO5: Infer the statistical inferential methods based on small and large sampling tests **(L4)**

UNIT - I: Iterative Methods:

Introduction - Solutions of algebraic and transcendental equations: Bisection method - Secant method - Method of false position - Iteration method - Newton-Raphson method (One variable and simultaneous Equations)

Interpolation: Newton's forward and backward formulae for interpolation - Interpolation with unequal intervals - Lagrange's interpolation formula

UNIT - II: Numerical integration, Solution of ordinary differential equations with initial conditions:

Trapezoidal rule- Simpson's $1/3^{rd}$ and $3/8^{th}$ rule- Solution of initial value problems by Taylor's series- Picard's method of successive approximations- Euler's method -Runge-Kutta method (second and fourth order) - Milne's Predictor and Corrector Method.

UNIT - III: Probability and Distributions:

Baye's theorem - Random variables - Discrete and Continuous random variables - Distribution functions - Probability mass function, Probability density function and Cumulative distribution functions - Mathematical Expectation and Variance - Binomial, Poisson, Uniform and Normal distributions.

UNIT - IV: Sampling Theory:

Introduction - Population and Samples - Sampling distribution of Means and Variance (definition only) -Point and Interval estimations - Maximum error of estimate - Central limit theorem (without proof) - Estimation using t, x^2 and F-distributions.

UNIT- V: Tests of Hypothesis:

Introduction - Hypothesis - Null and Alternative Hypothesis - Type I and Type II errors - Level of significance- One tail and two-tail tests - Test of significance for large samples and Small Samples: Single and difference means - Single and two proportions - Student's t- test, F-test, x^2 -test.

TEXTBOOKS:

1. **B. S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. **Miller and Freund's,** Probability and Statistics for Engineers,7/e, Pearson, 2008.

REFERENCE BOOKS:

1. **Steven C. Chapra,** Applied Numerical Methods with MATLAB for Engineering and Science,Tata Mc. Graw Hill Education.
2. **M. K. Jain, S.R.K. Iyengar and R.K. Jain,** Numerical Methods for Scientific and Engineering Computation, New Age International Publications.
3. **Lawrence Turyn, Advanced** Engineering Mathematics, CRC Press.
4. **S. C. Gupta and V.K. Kapoor,** Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.
5. **Shron L. Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists,8th Edition, Pearson 2007.
6. **Jay** I. **Devore,** Probability and Statistics for Engineering and the Sciences, 9th Edition, Cengage.

B.Tech. (III Sem.)	23HS01 - UHV 2 – UNDERSTANDING HARMONY AND ETHICAL HUMAN CONDUCT	L	T	P	Cr.
		2	1	0	3

Course Objectives:

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

Course Outcomes:

CO1: Describe the terms like Natural Acceptance, Happiness and Prosperity **(L2)**
CO2: Identify one's self, and one's surroundings (family, society nature) **(L2)**
CO3: Relate human values with human relationship and human society. **(L2)**
CO4: Illustrate the need for universal human values and harmonious existence **(L2)**
CO5: Develop as socially and ecologically responsible engineers **(L3)**

Course Topics The course has 28 lectures and 14 tutorials in 5 modules. The lectures and tutorials are of 1- hour duration. Tutorial sessions are to be used to explore and practice what has been proposed during the lecture sessions. The Teacher's Manual provides the outline for lectures as well as practice sessions. The teacher is expected to present the issues to be discussed as propositions and encourage the students to have a dialogue.

UNIT I

Introduction to Value Education (6 lectures and 3 tutorials for practice session)
Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)
Lecture 2: Understanding Value Education
Tutorial 1: Practice Session PS1 Sharing about Oneself
Lecture 3: self-exploration as the Process for Value Education
Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations
Tutorial 2: Practice Session PS2 Exploring Human Consciousness
Lecture 5: Happiness and Prosperity – Current Scenario
Lecture 6: Method to Fulfill the Basic Human Aspirations
Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT II Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Lecture 7: Understanding Human being as the Co-existence of the self and the body.
Lecture 8: Distinguishing between the Needs of the self and the body
Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.
Lecture 9: The body as an Instrument of the self
Lecture 10: Understanding Harmony in the self
Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self
Lecture 11: Harmony of the self with the body
Lecture 12: Programme to ensure self-regulation and Health
Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III Harmony in the Family and Society (6 lectures and 3 tutorials for practice session)
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal.

UNIT IV Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence.

UNIT V Implications of the Holistic Understanding – a Look at Professional Ethics (6 lectures and 3 tutorials for practice session)
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order

Practice Sessions for UNIT I – Introduction to Value Education
PS1 Sharing about Oneself

PS2 Exploring Human Consciousness
PS3 Exploring Natural Acceptance

Practice Sessions for UNIT II – Harmony in the Human Being
PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self
PS6 Exploring Harmony of self with the body

Practice Sessions for UNIT III – Harmony in the Family and Society
PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfil Human Goal

Practice Sessions for UNIT IV – Harmony in the Nature (Existence)
PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence

Practice Sessions for UNIT V – Implications of the Holistic Understanding – a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

READINGS:

Textbook and Teachers Manual

a. The Textbook

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

b. **The Teacher's Manual**

1. R R Gaur, R Asthana, G P Bagaria,Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCE BOOKS

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj – PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions. While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements. In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values. It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content. Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by any one department. Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

Online Resources:

1. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf
4. https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf
5. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf

6. https://fdp-si.aicte-india.org/download/FDPTeachingMaterial/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3- S2A%20Und%20Nature-Existence.pdf
7. https://fdp-si.aicte india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%203- 25%20Ethics%20v1.pdf
8. https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human- values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385 https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

B.Tech. (III Sem.) **23CE01 - SURVEYING**

L	T	P	Cr.
3	0	0	3

Pre-requisites: NIL

Course Objectives:

1. Know the principle and methods of surveying and measuring of horizontal and vertical- distances and angles.
2. Identification of source of errors and rectification methods.
3. Know surveying principles to determine areas and volumes.
4. Setting out curves and use modern surveying equipment for accurate results.
5. Know the basics of Photogrammetry Surveying.

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

CO1: Summarize the principles and methods of surveying and measuring of horizontal and vertical- distances and angles. **(Understand)**

CO2: Identify the source of errors and rectification methods. **(Understand)**

CO3: Apply surveying principles to determine areas and volumes. **(Apply)**

CO4: Setting out curves and using modern surveying equipment. **(Apply)**

CO5: Understand the basics of Photogrammetry Surveying in field. **(Understand)**

UNIT - I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Surveying accessories. Introduction to Compass, leveling and Plane table surveying.

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip –systems and W.C.B and Q.B systems of locating bearings.

UNIT - II

Leveling- Types of levels, methods of levelling, and Determination of levels, Effect of Curvature of Earth and Refraction.

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

Areas - Determination of areas consisting of irregular boundary and regular boundary.

Volumes -Determination of volume of earth work in cutting and embankments for level section, capacity of reservoirs.

UNIT - III

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

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

UNIT - IV

Curves: Types of curves and their necessity, elements of simple, compound, reverse curves. Introduction to Tacheometric Surveying.

Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station-advantages and Applications. Introduction to Global Positioning System. Introduction to Drone survey and LiDAR Survey (Light Detection and Ranging).

UNIT - V

Photogrammetry Surveying:

Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo-plotting instruments, mosaics, map substitutes.

TEXTBOOKS:

1. Surveying (Vol –1 & 2) by Duggal S K,Tata McGraw Hill Publishing Co.Ltd. New Delhi, 5th edition, 2019.
2. Textbook of Surveying by C Venkatramaiah, Universities Press 1st Edition, 2011.

REFERENCES:

1. Surveying (Vol – 1), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi, 18th edition 2024.
2. Surveying (Vol – 2), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain -Laxmi Publications (P) ltd., New Delhi 17th 2022.
3. Surveying (Vol – 3), by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain -Laxmi Publications (P) ltd., New Delhi 16th 2023.
4. Plane Surveying and Higher Surveying by Chandra A M, New age Internation1al Pvt. Ltd., Publishers, New Delhi, 3rd Edition, 2015
5. Surveying and Levelling by N.Basak Tata McGraw Hill Publishing Co. Ltd. New Delhi, 4th edition, 2014.
6. Surveying (Vol 1, 2 & 3), by Arora K R, Standard Book House, Delhi. Edition: 12th, 2015.

Web Resources:

https://koha.srmap.edu.in/cgi-bin/koha/opac-detail.pl?biblionumber=11522&shelfbrowse_itemnumber=23066

B.Tech. (III Sem.) **23CE02 - STRENGTH OF MATERIALS**

L	T	P	Cr.
3	0	0	3

Pre-requisites: Engineering Mechanics

Course Objectives:

1. To impart Fundamental concepts of Strength of Material and Principles of Elasticity and Plasticity Stress.
2. To impart concepts of shear force and bending moment on various types of beams andloading conditions.
3. To impart concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections.
4. To the concepts above will be utilized in measuring deflections in beams under various loading and support conditions.
5. To classify cylinders and columns based on their thickness and to derive equations formeasurement of stresses across the cross section when subjected to external pressure.

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

CO1: To relate the deformations with the stress strain characteristics of materials under axial loading. **(Understand)**

CO2: To draw the diagrams indicating the variation of the key performance features like axial forces, bending moment and shear forces in structural members. **(Apply)**

CO3: To calculate section modulus and for determination of stresses developed in the beams. **(Apply)**

CO4: To compute the deflections due to various loading conditions. **(Apply)**

CO5: To determine stresses across sections of the thin, thick cylinders and columns to arrive at optimum sections to withstand the internal pressure using Lame's equation. **(Apply)**

UNIT — I:

Simple Stresses and Strains: Elasticity and plasticity — Types of stresses and strains — Hooke's law — Factor of safety, Poisson's ratio - Relationship between Elastic constants — Bars of varying section — stresses in composite bars.

UNIT — II:

Shear Force and Bending Moment: Definition of beam — Types of beams — Concept of shear force and bending moment — Point of contra flexure — Relation between S.F., B.M and rate of loading at a section of a beam; S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads.

UNIT — III:

Flexural and Shear Stresses:

Flexural Stresses: Theory of simple bending — Assumptions — Derivation of bending equation, Neutral axis — Determination of bending stresses — section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections — Design of simple beams

Shear Stresses: Derivation of formula — Shear stress distribution across various beam sections like rectangular, circular, I, T Angle sections.
Torsion – circular shafts only.

UNIT — IV:

Deflection of Beams: Double integration and Macaulay's methods — Determination of slope and deflection for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads. Mohr's theorems — Moment area method — application to simple cases of cantilever.

UNIT — V:

Introduction – Classification of columns – Axially loaded compression members – Euler's crippling load theory – Derivation of Euler's critical load formulae for various end conditions – Equivalent length – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Eccentric loading and Secant formula – Prof. Perry's formula.

Thin and Thick cylindrical shells — Derivation of formula for longitudinal and circumferential stresses — hoop, longitudinal and volumetric strains — changes in diameter, and volume of thin cylinders. Lames theory for thick cylinders, Derivation of Lames formulae, distribution of hoop and radial stresses across the thickness, compound cylinders-distribution of stresses

TEXTBOOKS:

1. Strength of Materials by R. K. Bansal, Lakshmi Publications, 16th Edition, 2022.
2. Strength of Materials by J.K. Gupta and S.K. Gupta, Cengage publications 2nd edition, 2024.

REFERENCES:

1. Strength of Materials by B. S. Basavarajaiah and P. Mahadevappa, Universities Press 3rd Edition, 2010.
2. Advanced Mechanics of Solids, L.S Srinath, McGraw Hill Education, 2017, 3rd Edition.
3. Strength of Materials - Fundamentals and Applications, T.D.Gunneswara Rao and MudimbyAndal, Cambridge University Press, 2018, 1st Edition.
4. Mechanics of Materials, Beer and Johnston, McGraw Hill India Pvt. Ltd., 2020, 8th Edition (SI Units).
5. Mechanics of Solids — E P Popov, Prentice Hall, 2nd Edition, 2015.
6. A Textbook of Strength of Materials, by R. K. Rajput, 7e (Mechanics of Solids) SI Units S. Chand & Co, NewDelhi 7th edition 2022.
7. Strength of Materials by S.S.Ratan Tata McGrill Publications 3rd Edition , 2016.

L	T	P	Cr.
3	0	0	3

B.Tech. (III Sem.) **23CE03 - FLUID MECHANICS**

Pre-requisites: Engineering Mechanics

Course Objectives:

1. To explain basics of statics, kinematics and dynamics of fluids and various measuring techniques of hydrostatic forces on objects.
2. To impart ability to solve engineering problems in fluid mechanics.
3. To enable the students measure quantities of fluid flowing in pipes, tanks andchannels.
4. To teach integral forms of fundamental laws of fluid mechanics to predict relevant pressures, velocities and forces.
5. To strengthen the students with fundamentals useful in application-intensive courses dealing with hydraulics, hydraulic machinery and hydrology in future courses.

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

CO1: Understand the fluid properties, principles of fluid statics, and buoyancy. **(Understand)**

CO2: Apply the laws of fluid statics and buoyancy. **(Apply)**

CO3: Understand the fundamentals of fluid kinematics, dynamics, differentiate types of fluid flows and loss in pipes. **(Understand)**

CO4: Derive and apply the principle of conservation of mass energy and momentum for flow measurement. **(Apply)**

CO5: Compute the losses in pipes and discharge through pipe flows. **(Apply)**

UNIT - I

Basic concepts and definitions: Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; Variation of viscosity with temperature, Newton law of viscosity; Vapor pressure, Boiling point, Surface tension, Capillarity, Bulk modulus of elasticity, Compressibility.

Fluid Pressure: Pressure at a point, Pascal‘s law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer. Pressure gauges,

UNIT – II

Fluid statics: Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies-Center of Buoyancy, Metacenter, Conditions of Equilibrium for floating bodies and submerged bodies.

UNIT - III

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.

UNIT - IV

Fluid Dynamics: Surface and body forces; Equations of motion - Euler 's equation; Bernoulli's equation – Derivation; Energy Principle; Practical applications of Bernoulli's equation : Venturimeter, orifice meter and Pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend;– Free and Forced Vortex Flow – governing equations and applications.

UNIT - V

Analysis of Pipe Flow: Energy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length – Pipes in Parallel and Series. Dimensional Numbers: Derivations and applications of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number;

TEXTBOOKS:

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024.
2. P. N. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House 22nd 2019.

REFERENCES:

1. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition 2018
2. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
3. N. Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, UniversitiesPress Pvt Ltd, Hyderabad. 3rd Edition 2009.
4. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9th edition,2022.
5. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, SChakraborty Tata McGraw Hill, 3rd edition 2011

Online Learning Resources:

https://archive.nptel.ac.in/courses/112/105/112105269/
https://nptel.ac.in/courses/112104118 https://nptel.ac.in/courses/105103192

L	T	P	Cr.
0	0	3	1.5

B.Tech. (III Sem.) **23CE52 - SURVEYING LAB**

Pre-requisites: NIL

Course Objectives: By the end of this course student will be able to

1. Know about various linear and angular measuring instruments
2. Take Measurements in the linear and angular view
3. Determine the area and volume by interpreting the data obtained from surveyingactivities
4. Know modern equipment such as total station
5. Draft field notes from survey data

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

CO1: Handle various linear and angular measuring instruments **(Apply)**

CO2: Measure the linear and angular measurements **(Apply)**

CO3: Calculate the area and volume by interpreting the data obtained from surveying **(Apply)**

CO4: Handle modern equipment such as total station **(Apply)**

CO5: Prepare field notes from survey data **(Understand)**

Students have to perform any 10 of the following Experiments:

List of Field Works:

1. Chain survey of road profile with offsets in case of road widening.
2. Determination of distance between two inaccessible points by using compass.
3. Plane table survey ;finding the area of a given boundary by the method of Radiation
4. Fly levelling : Height of the instrument method (differential leveling)
5. Fly levelling: rise and fall method.
6. Theodolite survey: determining the horizontal and vertical angles by the method ofrepetition method
7. Theodolite survey: finding the distance between two in accessible points.
8. Theodolite survey: finding the height of far object.
9. Determination of area perimeter using total station.
10. Determination of distance between two inaccessible point by using total station.
11. Setting out a curve
12. Determining the levels of contours

REFERENCES:

1. R Agor, A textbook of surveying and levelling, Kanna Publishers, New Delhi, 1998.
2. Punmia B C, Surveying Volume-1&2, Lakshmi Publications, 9th and 10th Editions, 1987

B.Tech. (III Sem.) **23CE53 - STRENGTH OF MATERIALS LAB**

L	T	P	Cr.
0	0	3	1.5

Pre-requisites: NIL

Course objectives: By the end of this course student will be able to

3. To determine the tensile strength and yield parameters of mild steel
4. To find out flexural strengths of Steel/Wood specimens and measure deflections
5. To determine the torsion parameters of mild steel bar
6. To determine the hardness numbers, impact and shear strengths of metals
7. To determine the load-deflection parameters for springs

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

CO1: Conduct tensile strength test and draw stress-strain diagrams for ductile metals **(Apply)**

CO2: Perform bending test and determine load-deflection curve of steel/wood **(Apply)**

CO3: Able to conduct torsion test and determine torsion parameters **(Apply)**

CO4: Perform hardness, impact and shear strength tests and calculate hardness numbers, impact and shear strengths **(Apply)**

CO5: Able to conduct tests on closely coiled and open coiled springs and calculate deflections **(Apply)**

Students have to perform any 10 of the following Experiments:

LIST OF EXPERIMENTS:

1. Tension test.
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on overhanging beam.
4. Bending test on simply supported beam.
5. Torsion test.
6. Hardness test.
7. Compression test on Open coiled springs
8. Tension test on Closely coiled springs
9. Compression test on wood/ concrete
10. Izod / Charpy Impact test on metals
11. Shear test on metals
12. Use of electrical resistance strain gauges.
13. Continuous beam – deflection test.

REFERENCES:

1. Laboratory manual prepared by Civil Engineering department.

B.Tech. (III Sem.) **23CES1 - BUILDING PLANNING AND DRAWING**

L	T	P	Cr.
0	1	2	2

Pre-requisites: NIL

Course Objectives:

1. Initiating the student to different building bye-laws and regulations.
2. Imparting the planning aspects of residential buildings and public buildings.
3. Giving training exercises on various signs and bonds.
4. Giving training exercises on different building units.
5. Imparting the skills and methods of planning of various buildings.

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

CO1: Draw signs and bonds **(Remember)**

CO2: Draw different building units **(Remember)**

CO3: Plan various buildings as per the building by-laws. **(Apply)**

CO4: Learn the skills of drawing building elements and plan the buildings as per requirements. **(Apply)**

LIST OF EXPERIMENTS

1. Detailing & Drawing of Sign Conventions.
2. Detailing & Drawing of English Bond.
3. Detailing & Drawing of Flemish Bond.
4. Detailing & Drawing of Doors.
5. Detailing & Drawing of Windows.
6. Detailing & Drawing of Ventilators & Roofs.
7. Drawing of Line Diagram of Residential Buildings by using Building Bye- Laws.
8. Drawing of Plan, Elevation & Section from line diagram for a single Storey Building.
9. Drawing of Plan, Elevation & Section for Hospital Building.
10. Drawing of Plan, Elevation & Section for Industrial Building.

TEXTBOOKS:

1. Planning, designing and Scheduling, Gurcharan Singh and Jagdish Singh
2. Building drawing, M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, NewDelhi.

REFERENCES:

1. National Building Code 2016 (Volume- I & II).
2. Building planning and drawing by M. Chakraborti.
3. Principles of Building Drawing, M G Shah and C M Kale, Trinity Publications,New Delhi.
4. Civil Engineering drawing and House planning, B. P. Verma, Khanna publishers,NewDelhi.
5. Civil Engineering Building practice, Suraj Singh: CBS Publications, New Delhi,and Chennai
6. Building Materials and Construction, G. C Saha and Joy Gopal Jana,

McGrawHill Education (P)India Ltd. New Delhi.

L	T	P	Cr.
2	0	0	-

B.Tech. (III Sem.) **23MC01 - ENVIRONMENTAL SCIENCE**

Course Objectives:

The objective of this course is to understand Environmental issues like natural resource depletion, pollution, interaction between human and ecosystems and their role in the food web in the natural world, importance of global biodiversity and significance of environmental law in India.

Course Outcomes: In this course the student will learn about

CO1: The necessity of resources, their exploitation and sustainable management **(Understand – L2)**

CO2: The interactions of human and ecosystems and their role in the food web in the natural world and the global biodiversity, threats to biodiversity and its conservation. **(Understand – L2)**

CO3: Environmental problems like pollution, disasters and possible solutions. **(Remember – L1)**

CO4: The importance of environmental decision making in organizations through understanding the environmental law and environmental audits. **(Remember – L1)**

CO5: Environmental issues like over population, human health etc related to local, regional and global levels. **(Understand – L2)**

UNIT – I

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT – II

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and Its Conservation : Introduction and Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at

global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – III

Environmental Pollution: Definition, Cause, effects and control measures of:

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

UNIT – IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Carbon credits & Mission LiFE - Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

UNIT – V

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

TEXTBOOKS:

1. Erach Bharucha,Text book of Environmental Studies for Undergraduate Courses,Universities Press (India) Private Limited, 2019.
2. Palaniswamy, Environmental Studies, 2/e, Pearson education, 2014.
3. S.Azeem Unnisa, Environmental Studies, Academic Publishing Company, 2021.
4. K.Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, SciTech Publications (India), Pvt. Ltd, 2010.

REFERENCE BOOKS:

1. KVSG Murali Krishna, The Book of Environmental Studies, 2/e, VGS Publishers, 2011.
2. Deeksha Dave and E.Sai Baba Reddy, Textbook of Environmental Science, 2/e, Cengage Publications, 2012.
3. M.Anji Reddy, "Textbook of Environmental Sciences and Technology", BS Publication, 2014.
4. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications, 2006.
5. J. Glynn Henry and Gary W. Heinke, Environmental Sciences and Engineering, Prentice Hall of India Private limited, 1988.
6. G.R. Chatwal, A Text Book of Environmental Studies, Himalaya Publishing House, 2018.
7. Gilbert M. Masters and Wendell P. Ela, Introduction to Environmental Engineering and Science, 1/e, Prentice Hall of India Private limited, 1991.

Online Learning Resources:

- **https://onlinecourses.nptel.ac.in/noc23_hs155/preview**
- **https://www.edx.org/learn/environmental-science/rice-university-ap-r-environmental-science-part-3-pollution-and-resources?index=product&objectID=course-3a6da9f2-**

B.Tech. (IV Sem.)	23HS02- MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	L	T	P	Cr.
		2	0	0	2

Course Objectives:

1. To inculcate the basic knowledge of Managerial economics and Financial Accounting
2. To make the students learn how demand is estimated for different products, input output relationship for optimizing production and cost
3. To Know the Various types of market structure and pricing methods and strategy
4. To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
5. To provide fundamental skills on accounting and to explain the process of preparing financial statements.

Course Outcomes:

CO1: Define the concepts related to Managerial Economics, Financial Accounting and Management **(L2)**

CO2: Understand the Fundamentals of Economics viz., Demand, Production, Cost, Revenue and Markets **(L2)**

CO3: Apply the Concept of Production cost and Revenues for effective Business Decision **(L3)**

CO4: Evaluate the Capital Budgeting Techniques. **(L3)**

CO5: Develop the Accounting Statements and Evaluate the Financial Performance of Business Entity **(L4)**

Unit -I

Introduction to Managerial Economics: Economics-Managerial Economics-Nature and Scope. Demand-Law of demand-Elasticity of demand-Types of Elasticity of demand-Demand Forecasting -Methods.

Unit -II

Theory of Production and Cost analysis: Production Function-Isoquant and Isocost, Least Cost Combination of inputs. Law of Returns, Internal and External Economies of Scale. Cost Concepts & Break-even Analysis.

Unit -III

Markets & Pricing Policies

Market structures: Markets-Types of markets - Features and price out determinations under Perfect competition, Monopoly, Monopolistic Competition. Pricing –Pricing polices & its Objectives – Pricing Methods and its applications in business.

Unit -IV

Capital and Capital Budgeting: Nature and its significance-Types of Capital - Sources of raising capital. Capital budgeting-Significance –Process- Techniques of Capital Budgeting (non-discounted cash flow techniques and discounted cash flow of techniques).

Unit-V

Financial Accounting and analysis: Accounting –significance -- Book Keeping-Double entry system –Journal- Ledger- Trial Balance- Final Accounts with simple adjustments. Financial Statement Analysis through ratios.

TEXTBOOKS:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

REFERENCE BOOKS:

1. Ahuja H Managerial economics S Chand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

Online Learning Resources:

1.https://www.slideshare.net/123ps/managerial-economics-ppt
2.https://www.slideshare.net/rossanz/production-and-cost-45827016
3.https://www.slideshare.net/darkyla/business-organizations-19917607
4.https://www.slideshare.net/balarajbl/market-and-classification-of-market
5.https://www.slideshare.net/ruchi101/capital-budgeting-ppt-59565396
6.https://www.slideshare.net/ashu1983/financial-accounting

B.Tech. (IV Sem.) **23CE04 - ENGINEERING GEOLOGY**

L	T	P	Cr.
3	0	0	3

Pre-requisites: NIL

Course Objectives: The objective of this course is:

1. To know the importance of Engineering Geology to the Civil Engineering.
2. To enable the students understand what minerals and rocks are and their formationand identification.
3. To highlight significance/ importance/ role of Engineering Geology in constructionof Civil Engineering structures.
4. To enable the student realize its importance and applications of Engineering Geologyin Civil Engineering constructions.
5. concepts of Groundwater and its geophysical methods.

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

CO1: Understand and interpret fundamental geological processes and geological formations. **(Understand)**

CO2: Differentiate various properties of minerals and rocks. **(Understand)**

CO3: Illustrate geological structural features **(Understand)**

CO4: Understand geological principles in civil engineering applications. **(Understand)**

UNIT-I:

Introduction: Branches of Geology, Importance of Geology in Civil Engineering with case studies, Weathering of rocks, Geological agents, weathering process of Rock, Rivers and geological work of rivers.

UNIT-II

Mineralogy And Petrology: Definitions of mineral and rock-Different methods of study of mineral and rock. Physical properties of minerals and rocks for megascopic study for the following minerals and rocks. Common rock forming minerals: Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite and Bauxite. Classification, structures ,textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate.

UNIT-III

Structural Geology: Strike , Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering.

UNIT-IV

Ground Water: Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques.

Earthquakes and Land Slides: Terminology, Classification, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides.

Geophysics: Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

UNIT-V

Geology of Dams, Reservoirs and Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Geology consideration for successful constructions of reservoirs, Life of Reservoirs. Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunnelling.

TEXTBOOKS:

1. Engineering Geology by N. ChennaKesavulu, Laxmi Publications. 2nd Edn 2014.
2. Engineering & General Geology by Parbin Singh Katson educational series 8th 2023

REFERENCES:

1. Engineering Geology by SubinoyGangopadhay Oxford University press 1st edition, 2012.
2. Engineering Geology by D. Venkat Reddy, Vikas Publishing, 2nd Edn , 2017, Geology for Engineers and Environmental Society' Alan E Kehew, 3rd edn., 2013) Pearson publications.
3. 'Environmental Geology' (2013) K.S.Valdiya, 2nd ed., McGraw Hill Publications.

Web Materials:

1. http://nptel.iitm.ac.in/video.php?subjectId=105105106
2. http://nptel.iitm.ac.in/video.php?courseId=1055&p=1
4. http://nptel.iitm.ac.in/video.php?courseId=1055&p=3
5. http://nptel.iitm.ac.in/video.php?courseId=1055&p=4

B.Tech. (IV Sem.) **23CE05 - CONCRETE TECHNOLOGY**

L	T	P	Cr.
3	0	0	3

Pre-requisites: NIL

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

1. Learn materials and their properties used in the production of concrete
2. Learn the behavior of concrete at fresh stage
3. Learn the behavior of concrete at hardened stage
4. Learn the influence of elasticity, creep and shrinkage on concrete
5. Learn the mix design methodology and special concretes

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

CO1: Familiarize the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field. **(Remember)**

CO2: Test the fresh concrete properties and the hardened concrete properties. Understand the basic concepts of concrete. Design the concrete mix by BIS method. **(Understand)**

CO3: Determine the ingredients of concrete through lab test results. realize the importance of quality of concrete **(Understand)**

CO4: Understand the behaviour of concrete in various environments. **(Understand)**

CO5: Familiarize the basic concepts of special concrete and their production and applications. **(Remember)**

UNIT- I

CEMENTS: Portland cement – Chemical composition – Hydration, Setting ofcement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand –Deleterious substances – Soundness – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates-Maximum aggregate size- Quality of mixing water.

UNIT- II

FRESH CONCRETE: Steps in manufacture of Concrete–proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of 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 and vibration of concrete, Ready mixed concrete, Shotcrete.

UNIT- III

HARDENED CONCRETE: Water / Cement ratio – Abram's Law – Gel/space ratio Nature of strength of concrete –Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete: Compression test – Tension test – Factors affecting strength – Flexure test –Splitting test – Non-destructive testing methods – Codal provisions for NDT.

UNIT- IV

ELASTICITY, CREEP & SHRINKAGE – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage –types of shrinkage.

UNIT- V

MIX DESIGN AND SPECIAL CONCRETES: Ready mixed concrete, Fibrereinforced concrete – Different types of fibres – Factors affecting properties of FRC, High performance concrete – Self consolidating concrete, Self-healing concrete.

Factors in the choice of mix proportions –Quality control of concrete- Statistical methods-Acceptance Criteria-Concepts Proportioning of concrete mixes by ACI method and IS Code method

TEXTBOOKS

1. Properties of Concrete by A.M. Neville – PEARSON – 4th edition
2. Concrete Technology by M.L. Gambhir. – Tata Mc.Graw Hill Publishers, New Delhi 5thedition 2013.

REFERENCES:

1. Concrete Microstructure, Properties of Materials by P.K. Mehta and Moterio. McGrawHill 4th edition 2014
2. Concrete Technology, J.J. Brooks and A. M. Neville, Pearson, 2019, 2nd Edition.
3. Concrete Technology by M. S. Shetty. – S. Chand & Co.; 2004
4. Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi
5. Concrete Technology by Job Thomas, Cengagae Publications, 1st edition, 2015

B.Tech. (IV Sem.) **23CE06 - STRUCTURAL ANALYSIS**

L	T	P	Cr.
3	0	0	3

Pre-requisites: Strength of Materials

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

1. Learn energy theorems
2. Learn the analysis of indeterminate structures
3. Analysis of fixed and continuous beams
4. Learn about slope-deflection method
5. Learn about Moment – distribution method

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

CO1: Apply energy theorems to analyze trusses **(Apply)**

CO2: Determine unknown reactions of indeterminate structures by using Castigliano's–II Theorem **(Apply).**

CO3: Compute the internal forces of members in fixed and continuous beams **(Apply)**

CO4: Evaluate the internal forces of members portal frames by using slope-deflection method **(Apply)**

CO5: Analyze continuous beams and portal frames by using Moment – distribution method **(Apply)**

UNIT – I

Energy Theorems: Introduction-Strain energy in linear elastic system, expression ofstrain energy due to axial load, bending moment and shear forces – Castigliano's first theorem Deflections of simple beams and pin jointed trusses.

UNIT - II

Analysis of indeterminate structures: Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses with upto two degrees of internal and external indeterminacies – Castigliano's–II theorem.

UNIT - III

Fixed beams & continuous beams: Introduction to statically indeterminate beams with uniformly distributed load, central point load, eccentric point load, number of pointloads, uniformly varying load, couple and combination of loads – Shear force and Bending moment diagrams – Deflection of fixed beams effect of sinking of support, effect of rotationof a support.

UNIT - IV

Slope-deflection method: Introduction-derivation of slope deflection equations- application to continuous beams with and without settlement of supports - Analysis of single bayportal frames without sway.

UNIT - V

Moment distribution method: Introduction to moment distribution method-Application to continuous beams with and without settlement of supports-Analysis of single bay storey portal frames without sway.

TEXTBOOKS:

1. Analysis of Structures – Vol-I&II by V.N.Vazirani&M.M.Ratwani, Khanna Publications,
   New Delhi.
2. Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers. 3rd edition 2017.

REFERENCE BOOKS:

1. Structural analysis by Aslam Kassimali Cengage publications 6th edition 2020.
2. Structural analysis Vol.I and II by Dr.R.Vaidyanathan and Dr.PPerumal– Laxmi publications. 3rd 2016.
3. Introduction to structural analysis by B.D.Nautiyal, New Age international publishers, New Delhi.
4. Structural Analysis – D.S.Prakasarao -Univeristy press.
5. Strength of Materials and Mechanics of Structures by B.C.Punmia, Khanna Publications, New Delhi.

B.Tech. (IV Sem.)	23CE07 - HYDRAULICS AND HYRAULIC MACHINERY	L	T	P	Cr.
		3	0	0	3

Pre-requisite: Fluid Mechanics

Course Objectives:

1. To Introduce concepts of laminar and turbulent flows
2. To Illustrate principles of uniform and non-uniform flows through open channel.
3. To impart knowledge on design of turbines and pumps

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

CO1: Understand the characteristics of laminar and turbulent flows. **(Understand)**

CO2: Understand the fundamentals in open channel flow **(Understand)**

CO3: Apply the knowledge of fluid mechanics to solve the uniform and non-uniform flow problems in open channels. **(Apply)**

CO4: Understand the principles, losses and ~~its~~ efficiencies of centrifugal pumps **(Understand)**

CO5: Determine the performance of impact of jets on plates, Pelton wheel, and Francis turbine and centrifugal pump **(Apply)**

UNIT – I

Laminar & Turbulent flow in pipes: Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke‘s law, Measurement of viscosity. Reynolds experiment, Transition from laminar to turbulent flow. Resistance to flow of fluid in smooth and rough pipes-Moody‘s diagram – Introduction to boundary layer theory.

UNIT - II

Uniform flow in Open Channels: Open Channel Flow - Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section. Hydraulically efficient channel sections: Rectangular, trapezoidal and triangular channels, Energy and Momentum correction factors

UNIT - III

Non-Uniform flow in Open Channels: Specific energy, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Measurement of Discharge and Velocity – Gradually Varied Flow- Dynamic Equation of Gradually Varied Flow. Hydraulic Jump and classification - Elements and characteristics- Energy dissipation.

UNIT - IV

Impact of Jets: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes - Velocity triangles at inlet and outlet - Work done and efficiency Hydraulic Turbines: Classification of turbines; pelton wheel and its design. Francis turbine and its design - efficiency - Draft tube: theory - characteristic curves of hydraulic turbines. Cavitation: causes and effects.

UNIT – V

pumps: Working principles of a centrifugal pump, work done by impeller; heads, losses and efficiencies; minimum starting speed; Priming; specific speed; limitation of suction lift, net positive suction head (NPSH); Performance and characteristic curves; Cavitation effects; Multistage centrifugal pumps; troubles and remedies

TEXTBOOKS: -

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P)Ltd., New Delhi 11th edition, 2024.
2. P. N. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House 22nd, 2019.

REFERENCES:

1. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition 2018
2. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9th edition , 2022.
3. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery,Oxford University Press, 2010.
4. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, SChakraborty 3rd edition 2011

Online Learning Resources: https://nptel.ac.in/courses/105105203
https://archive.nptel.ac.in/courses/112/106/112106300/
https://archive.nptel.ac.in/courses/112/103/112103249/

B.Tech. (IV Sem.) **23CE54 - CONCRETE TECHNOLOGY LAB**

L	T	P	Cr.
0	0	3	1.5

Pre-requisites: NIL

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

To test basic properties of ingredients of concrete fresh and hardened concreteproperties

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

CO1: Outline importance of testing cement and its properties **(Apply)**

CO2: Assess different properties of aggregates **(Apply)**

CO3: Assess fresh concrete properties and their relevance to hardened concrete **(Apply)**

CO4: Assess hardened concrete properties **(Apply)**

LIST OF EXPERIMENTS

1. **Tests on Cement**
   - Normal Consistency and Fineness of cement.
   - Initial setting time and Final setting time of cement.
   - Specific gravity and soundness of cement.
   - Compressive strength of cement.
2. **Tests on Fine Aggregates**
   - Grading and fineness modulus of Fine aggregate by sieve analysis.
   - Specific gravity of fine aggregate
   - Water absorption and Bulking of sand.
3. **Tests on Coarse Aggregates**
   - Grading of Coarse aggregate by sieve analysis.
   - Specific gravity of coarse aggregate
   - Water absorption of Coarse aggregates
4. **Tests on fresh Concrete**
   - Workability of concrete by compaction factor method
   - Workability of concrete by slump test
   - Workability of concrete by Vee-bee test.
5. **Tests on Hardened Concrete**
   - Compressive strength of cement concrete and Modulus of rupture
   - Young's Modulus and Poisson's Ratio
   - Split tensile strength of concrete.
   - Non-Destructive testing on concrete (for demonstration)

REFERENCES:

1. Laboratory manual prepared by Civil Engineering department.

B.Tech. (IV Sem.)	23CE55 - ENGINEERING GEOLOGY LAB	L	T	P	Cr.
		0	0	3	1.5

Pre-requisites: NIL

Course Objectives:

1. To identify the Megascopic types of Ore minerals & Rock forming minerals.
2. To identify the Megascopic types of Igneous, Sedimentary, Metamorphic rocks.
3. To identify the topography of the site & material selection

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

CO1: Demonstrate the importance of geological principles. **(Understand)**

CO2: Distinguish various types of minerals and rocks based on physical properties and physical observations. **(Understand)**

CO3: Interpret structural patterns of various geological structures. **(Understand)**

LIST OF EXPERIMENTS

1. Physical properties of minerals: Mega-scopic identification of

a. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Micagroup & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc…

b. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite,Chromite, etc…

2. Megascopic description and identification of rocks.

a. Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc.

b. Sedimentary rocks – Sand stone, Ferrugineous sand stone, Lime stone, Shale,Laterite, Conglamorate, etc.

c. Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite& Biotiteschist, Marble, Khondalite, etc.

3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.

4. Simple Structural Geology problems.

5. Bore hole data.

6. Strength of the rock using laboratory tests.

7. Field work – To identify Minerals, Rocks, Geomorphology& Structural Geology.

LAB EXAMINATION PATTERN:

1. Description and identification of FOUR minerals
2. Description and identification of FOUR (including igneous, sedimentary and metamorphic rocks)
3. ONE Question on Interpretation of a Geological map along with a geological section.
4. TWO Questions on Simple strike and Dip problems.

5. Bore hole problems.
6. Project report on geology.

REFERENCES:

1. 'Applied Engineering Geology Practicals' by M T Mauthesha Reddy, New AgeInternational Publishers, 2nd Edition.
2. 'Foundations of Engineering Geology' by Tony Waltham, Spon Press, 3rd edition,2009.

B.Tech. (IV Sem.)	23CES2 - REMOTE SENSING & GEOGRAPHICAL INFORMATION SYSTEMS	L	T	P	Cr.
		0	1	2	2

Pre-requisites: NIL

Course Objectives: The course is designed to

1. Introduce the basic principles of Remote Sensing and GIS techniques and its application to Civil Engineering.
2. Learn various types of sensors and platforms and understand the principles of spatial analysis techniques in GIS.
3. Introduce GIS software to understand the process of digitization, creation of thematic map from toposheets and maps.

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

CO1: Acquire knowledge about concepts of Remote Sensing and GIS applications. **(Understand)**

CO2: Perform digital image analysis and interpret digital image characteristics. **(Understand)**

CO3: Digitize and create thematic map and extract important features to calculate geometry. **(Apply)**

CO4: Illustrate the GIS applications for developing elevations using TIN/DEM and stream ordering map. **(Understand)**

CO5: Apply GIS software to perform simple analysis for Civil Engineering problems **(Apply)**

UNIT – I

Introduction to Remote sensing: History of Remote Sensing, Electromagnetic Radiation, Electromagnetic Spectrum, Energy Interaction with Atmosphere, Energy Interaction with the Earth Surfaces - Characteristics of Remote Sensing Systems, Sensor Resolutions, Advantages& Limitations - Platforms: Types of Sensors, Airborne Remote Sensing, Spaceborne Remote Sensing - IRS, LANDSAT, SPOT & Recent satellite.

UNIT – II

Digital Image analysis: Digital Image Characteristics, Digital Image Data Formats, Band Interleaved by Pixel (BIP), Band Interleaved by Line (BIL), Band Sequential (BSQ) - Visual Interpretation Elements, Preprocessing, Enhancement, Classification, Supervised classification, Unsupervised classification.

UNIT – III

Introduction to Geographic Information System: Principles, Components and Applications of GIS - Map projections, Spatial Data Structures, Raster and Vector Data Formats, Data Inputs, Data Manipulation, Data Retrieval, Data Analysis - Spatial data analysis: Overlay Function-Vector Overlay Operations, Raster Overlay Operations, Arithmetic Operators, Comparison and Logical Operators, Conditional Expressions - Network Analysis: Components of network, Transportation network - Optimum path analysis.

TEXTBOOKS:

1. BasudebBhatta (2021). 'Remote sensing and GIS', 3rdedn., Oxford University Press.
2. S. Kumar, (2016) 'Basics of Remote sensing & GIS', Laxmi Publications.
3. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2022) 'Remote Sensing and ImageInterpretation', 7thedn., Wiley India Pvt. Ltd.
4. Demers, M.N, (2013) 'Fundamentals of Geographic Information Systems', 4thedn.,Wiley India Pvt. Ltd.

List of Experiments:

Expt. 1 :Georeferencing a Toposheet or Map

Expt. 2 : Digitization and Attribute table creation.

Expt. 3 : Creation of Thematic Map

Expt. 4 : Calculation of Feature geometry – Length, Area & Perimeter.

Expt. 5 : Contour map – developing TIN & DEM from Contour.

Expt. 6 : Stream network – Stream ordering map.

Expt. 7 : Watershed - calculate Hydro-geomorphological parameters.

Expt. 8 : Transportation Network Map – Route analysis.

GIS SOFTWARE: QGIS / ArcGIS

Textbook for Practical

1. QGIS User Guide
2. ArcGIS User Manual by ESRI

REFERENCES:

1. Schowengerdt, R. A (2006) 'Remote Sensing', Elsevier publishers.
2. Burrough P A and R.A. McDonnell, (1998) 'Principals of Geographical InformationSystems', Oxford University Press.
3. George Joseph (2013) 'Fundamentals of Remote Sensing', Universities Press.

Web references:

1. https://nptel.ac.in/courses/10510319

B.Tech. (IV Sem.) **23ME57 - DESIGN THINKING & INNOVATION**

L	T	P	Cr.
1	0	2	2

Course Objective: The objectives of the course are to

1. Bring awareness on innovative design and new product development.
2. Explain the basics of design thinking.
3. Familiarize the role of reverse engineering in product development.
4. Train how to identify the needs of society and convert into demand.
5. Introduce product planning and product development process.

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

CO1: Apply fundamental design components, principles, and new materials to create and improve design projects. **(Applying-L3)**

CO2: Apply the design thinking process to develop and present innovative product solutions. **(Applying-L3)**

CO3: Analyze the relationship between creativity and innovation, evaluate their roles in organizations, and develop strategic plans for transforming creative ideas into innovative solutions. **(Analyzing-L4)**

CO4: Analyze to work in a multidisciplinary environment. **(Analyzing-L4)**

CO5: Apply design thinking principles to address business challenges, develop and test business models and prototypes, and evaluate the value of creativity. (**Evaluating-L5)**

UNIT – I Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT – II Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT – III Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT – IV Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications. Innovation towards product design Case studies.

Activity: Importance of modeling, how to set specifications, Explaining their own product design.

UNIT – V Design Thinking in Business Processes

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs. Design thinking for Startups. Defining and testing Business Models and Business Cases. Developing & testing prototypes.

Activity: How to market our own product, about maintenance, Reliability and plan for startup.

TEXTBOOKS:

1. Tim Brown, Change by design, 1/e, Harper Bollins, 2009.
2. Idris Mootee, Design Thinking for Strategic Innovation, 1/e, Adams Media, 2014.

REFERENCE BOOKS:

1. David Lee, Design Thinking in the Classroom, Ulysses press, 2018.
2. Shrrutin N Shetty, Design the Future, 1/e, Norton Press, 2018.
3. William lidwell, Kritinaholden, &Jill butter, Universal principles of design, 2/e, Rockport Publishers, 2010.
4. Chesbrough.H, The era of open innovation, 2003.

Online Learning Resources:

- https://nptel.ac.in/courses/110/106/110106124/
- https://nptel.ac.in/courses/109/104/109104109/
- https://swayam.gov.in/nd1_noc19_mg60/preview
- https://onlinecourses.nptel.ac.in/noc22_de16/preview

B.Tech. (IV Sem.)	23MC02 - BUILDING MATERIALS AND CONSTRUCTION	L	T	P	Cr.
		3	0	0	-

Pre-requisites: NIL

Course Educational Objective: This course aims to provide study of the properties, making and applications of basic civil engineering materials such as stones, bricks, lime, cement and wood. The course also provides an insight into the different types masonry work used in construction practice, various building components and building finishing activities.

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

CO1: Understand the preparation process and the composition of construction materials such as Stones, bricks and timber. **(Understand)**

CO2: Describe the sources, constituents and storage of lime and cement for their appropriate usage as building materials based on their specific attributes. **(Understand)**

CO3: Identify the different components in a building and their specific purpose in the building. **(Remember)**

CO4: Classify the various types of mortars, masonry components and finishings used in the buildings. **(Remember)**

CO5: Identify the uses, good and faulty characteristics of different building materials. **(Remember)**

UNIT-I: STONES & BRICKS

Introduction-classification of rocks-– characteristic of good building stone-Dressing of stones- common building stones, their properties- compositions- uses.

Bricks: Composition of brick, constituents of brick earth- manufacturing process of bricks, characteristics of good building bricks, classification of bricks- Fly ash bricks, hollow bricks – uses.

UNIT-II: LIME AND CEMENT:

Lime - Introduction-lime stone- limestone cycle-sources of lime-properties of lime-uses – constituent of lime-classification of lime-precaution in handling of lime-storage of lime.

Cement-Introduction –classification-properties of cements- comparison between cement and lime-constituents of cement-functions of ingredients of cement-out line of manufacture of Portland cement- field tests for cement -types and uses of cements-storage of cements.

UNIT-III: MORTAR AND MASONRY Introduction- classification of mortars-characteristics of good mortar-Types of mortars - Preparation of mortar-Uses-Precautions in the uses of mortars. Types of masonry-joints in stone masonry, different bonds in bricks-tools for brick laying- English and Flemish bonds-defects in brick masonry-, importance of Cavity and Partition walls.

UNIT-IV: BUILDING COMPONENTS: Components of a building – Substructure and superstructure-Importance of foundation-functions of foundations-requirements of good foundations - different types of foundations –Purposes of foundation. Basic details of Lintels, Arches, walls, stair cases - types of floors - types of roofs.

UNIT-V: TIMBER AND FINISHINGS IN BUILDINGS: Classification of timber trees, cross section of exogenous tree, seasoning of timber, important types of timber and their uses, ply wood and its uses.

Paints: Functions of paints-types of paints - constituents of paints - characteristics of good paint-General precautions-defects in painting.

Damp proofing: Introduction-effects of dampness- methods of damp proofing –material used for D.P.C and treatment in buildings.

TEXTBOOKS

1. Rangwala "Engineering Materials (Material science)" Charotar Publishing House Pvt. ltd., Edition-2012
2. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain-"Building Construction"-Laxmi Publications (P) Ltd.

REFERENCES

1. S.K. Duggal "Building Materials"- - New age International Publisher, Fourth edition-2012
1. 2.R.K. Rajput "Engineering Materials (Including construction materials)"-, S.Chand Publications.
2. P.C Varghese "Building Construction" Prentice-Hall of India Private Ltd.

B.Tech. (V Sem.)	23CE08-DESIGN AND DRAWING OF REINFORCED CONCRETE STRUCTURES	L	T	P	Cr.
		3	0	0	3

Pre-requisites: Applied Mechanics, Strength of Materials, Structural Analysis

Course Educational Objectives: Learn the design principles of Working stress and Limit state designs as per IS: 456-2000, Identify the procedures of shear design parameters, Understand the design aspects of beams, slabs and columns as per IS: 456-2000.

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

CO1: Understand the fundamental procedures and guidelines given in relevant IS Codes for design of various RCC elements such as beams, columns, foundations, slabs, shear reinforcement, under Working stress and Limit State methods **(Understand-L2)**

CO2: Design and detailing of various flexural members **(Apply-L3)**

CO3: Limit state design of structures subjected to shear, bond and torsion **(Apply-L3)**

CO4: Design of compression members subjected to axial load, uni-axial and bi-axial moments, Design of different types of shallow foundations **(Apply-L3)**

CO4: Design the one way and two-way slabs with different end conditions using appropriate design guidelines **(Apply-L3)**

SYLLABUS:

UNIT –I

Introduction: Working stress method Design codes and handbooks, loading standards – Dead, live, wind and earthquake loads, elastic theory, design constants, modular ratio, neutral axis depth and moment of resistance, balanced, under-reinforced and over-reinforced sections, working stress method of design of singly and doubly reinforced beams.

Limit State Design: Concepts of limit state design – Basic statistical principles – Characteristic loads –Characteristic strength – Partial load and safety factors – representative stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress - block parameters – limiting moment of Resistance.

UNIT –II

Design for Flexure: Limit state analysis and design of singly reinforced sections- effective depth- Moment of Resistance- Doubly reinforced and flanged (T) beam sections- Minimum depth for a given capacity- Limiting Percentage of Steel- Minimum Tension Reinforcement- Maximum Flexural Steel- Design of Flanged Sections (T)- Effective width of flange –Behavior- Analysis and Design.

UNIT – III

Design for Shear, Torsion and Bond: Limit state analysis and design of section for shear and torsion for L Beam – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing. **Limit state design for serviceability:** Deflection, cracking and code provision.

UNIT – IV

Design of Compression members: Effective length of a column, Design of short and long columns – under axial loads, uniaxial bending and biaxial bending – Braced and un-braced columns – I S Code provisions.

Footings: Different types of footings – Design of isolated footings, Square footings – Rectangular footings – circular footing – spread & sloped footings - subjected to axial loads.

UNIT – V

Slabs: Classification of slabs, design of one - way slabs, two - way slabs, and continuous slabs using IS Coefficients (conventional), design of waist-slab staircase.

NOTE: All the designs to be taught in Limit State Method. Drawing classes must be conducted every week and the Following plates should be prepared by the students.

- Reinforcement detailing of T-beams, L-beams and continuous beams and cantilevers.
- Reinforcement detailing of columns and isolated footings.
- Detailing of one-way, two-way and continuous slabs and waist-slab staircase.

TEXTBOOKS:

1. 'Limit State Design' by A. K. Jain
2. 'Reinforced Concrete Structures' by S. Unnikrishna Pillai &Devdas Menon, Tata Mc.Graw Hill, New Delhi.

REFERENCES:

1. 'Design of concrete structures' by N. Krishna Raju.
2. 'Reinforced Concrete Structures' by Park and Pauley, John Wiley and Sons.

IS Codes:

1) IS -456-2000 (Permitted to use in examination hall)
2) IS – 875, 3) SP-16

B.Tech. (V Sem.)	23CE09-ENGINEERING HYDROLOGY	L	T	P	Cr.
		3	0	0	3

Pre-requisites: Fluid Mechanics, Hydraulics & Hydraulic Machinery

Course Educational Objectives:

The course allows the student to get the fundamentals of hydrology and its importance in development of water resources. The student to learn physical processes and their interactions in hydrology, measurement and estimation of the components of hydrologic cycle. Hydrographs, flood frequency analysis, design flood and flood routing methods. Study the concepts of groundwater movement and well hydraulics.

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

CO1: Understand the basic concepts of hydrology and factors affecting the hydrological components. **(Understand-L2)**

CO2: Compute the average rainfall over an area and estimate the runoff for a given data **(Apply-L3)**

CO3: Understand concepts of Hydrographs. flood frequency analysis, groundwater movement and well hydraulics. **(Understand-L2)**

CO4: Develop unit hydrograph and synthetic hydrograph, and estimate flood magnitude and carry out flood routing. **(Apply-L3)**

CO5: Determine aquifer parameters and yield of wells. **(Apply-L3)**

UNIT - I

Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data.

Precipitation: Types and forms, measurement, introduction to radar measurement of rain fall, rain gauge network, presentation of rainfall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm

UNIT-II

Abstractions: Initial abstractions, Evaporation: factors affecting, measurement, estimation, reduction, Evapotranspiration: factors affecting, measurement, estimation, control, Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

UNIT-III

Runoff: Factors affecting runoff, components, empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve.

Hydrograph analysis: Components of hydrograph, separation of base flow, effective rainfall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, dimensionless unit hydrograph, synthetic unit hydrograph, introduction to IUH.

UNIT-IV

Floods: Causes and effects, frequency analysis- Gumbel's and Log-Pearson type III distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management.

Flood Routing: Hydrologic routing, channel and reservoir routing-Muskingum and Puls methods of routing.

UNIT-V

Groundwater: Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, Dupuit's equation- steady radial flow to wells in confined and unconfined aquifers, yield of an open well-recuperation test.

TEXTBOOKS:

1. 'Engineering Hydrology' by Subramanya, K, Tata McGraw-Hill Education Pvt Ltd, (2013), New Delhi.
2. 'Engineering Hydrology' by Jayarami Reddy, P, Laxmi Publications Pvt. Ltd., (2013), New Delhi
3. 'Applied hydrology' by Chow V.T., D.R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt Ltd, (2011), New Delhi.
4. 'Engineering Hydrology' by Ojha C.S.P, R. Berndtsson and P. Bhunya, Oxford University Press, (2010).

REFERENCES:

1. 'Water Resources Engineering', Mays L.W, Wiley India Pvt. Ltd, (2013).
2. 'Hydrology' by Raghunath. H.M., New Age International Publishers, (2010)
3. 'Engineering Hydrology – Principles and Practice' by Ponce V.M., Prentice Hall International, (1994)
4. 'Hydrology and Water Resources Engineering' by Patra K.C., Narosa Publications, (2011)

B.Tech. (VI Sem.) **23CE10-GEOTECHNICAL ENGINEERING– I**

L	T	P	Cr.
3	0	0	3

Pre-requisites: NIL

Course Educational Objective: The course aims to teach the different properties and classifications of soil. The course coverage includes the various procedures for determining index and engineering properties of soils.

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

CO1: Understand the soil formation, its index properties and classification. **(Understand-L2)**

CO2: Understand the soil moisture and flow of water through soils and its effects. **(Understand-L2)**

CO3: Evaluate the stress distribution of soil subjected to different loading conditions. **(Apply-L3)**

CO4: Understand Compaction and Compressibility characteristics under partially saturated and fully saturated conditions. **(Understand-L2)**

CO5: Evaluate the shear strength of soil at different loading & drainage conditions for different soils. **(Apply-L3)**

UNIT – I

Introduction: Soil formation – Structure of Soils – Texture of Soils – Three phase system and phase relationships.

Index Properties and Classification Tests of Soils: Index properties **–** Density Index **-** Grain size analysis – Sieve and Hydrometer methods – Consistency of Clay Soils – Activity of Clays – Thixotropy of clays - soil Classification – Unified soil classification and I.S. Soil classification.

UNIT – II

Soil moisture and Capillarity: Soil moisture and modes of occurrence – Total, Neutral and Effective Pressures – Capillary Rise in soils.

Permeability: Flow of water through soils –- One dimensioned flow of water through soils – Darcy's law- permeability – Factors affecting –laboratory determination of coefficient of permeability –Permeability of layered systems.

UNIT –III

Seepage and Flow Nets: Flow net for one-dimensional flow – two-dimensional flow – Basic equation for Seepage – Flow nets & Characteristics and Uses – Quicksand condition –Seepage forces

Stress Distribution in Soils: Stresses induced by applied loads - Boussinesq's and Westergaard's theories for point loads and areas of different shapes– Newmark's influence chart – 2:1 stress distribution method. - Pressure Blubs.

UNIT – IV

Compaction: Mechanism of compaction – factors affecting – effects of compaction on soil properties - compaction control.

Consolidation: Compressibility of soils – e-p and e-log p curves – Stress history – Concept of consolidation - Spring Analogy - Terzaghi's theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation (c_v) - Over consolidated and normally consolidated clays.

UNIT - V

Shear Strength of Soils: Basic mechanism of shear strength - Mohr – Coulomb Failure theories – total and effective shear strength parameters – Stress-Strain behavior of Sands - Critical Void Ratio – Stress-Strain behavior of clays – Shear Strength determination- various drainage conditions – stress paths.

TEXTBOOKS:

1. 'Soil Mechanics and Foundation Engineering by Dr. K.R. Arora, Standard Publishers and Distributors, New Delhi.
2. Basic and Applied Soil Mechanics' by Gopal Ranjan and A.S.R.Rao, New Age International Publishers.
3. 'Soil Mechanics and Foundation Engineering' by V.N.S.Murthy ,CBS publishers
4. 'Geotechnical Engineering' by C. Venkataramaiah, New Age International Publishers.

REFERENCES:

1. 'Fundamentals of Soil Mechanics' by D.W.Taylor., Wiley.
2. 'An introduction to Geotechnical Engineering' by Holtz and Kovacs; Prentice Hall
3. Principles of Geotechnical Engineering, BrajaM.Das, Cengage Learing.

B.Tech. (V Sem.) **23CE11-ADVANCED STRUCTURAL ANALYSIS**

L	T	P	Cr.
3	0	0	3

Prerequisites: Applied Mechanics, Strength of Materials and Structural Analysis

Course Educational Objectives: The course includes analysis and design forces of arches and cables, Lateral load analysis of multistoried structures using portal and cantilever methods. It also covers sway analysis of frames using slope deflection and moment distribution methods. It provides knowledge of difference between determinate and Indeterminate structures also methods of finding deflections and unknown forces using Castigliano's theorem.

Course Outcomes:

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

CO1: Differentiate Determinate and Indeterminate Structures **(Apply-L3)**
CO2: Analyze three and two hinged arches **(Apply-L3)**
CO3: Carryout lateral Load analysis of structures **(Apply-L3)**
CO4: Analyze Cable and Suspension Bridge structures**(Apply-L3)**
CO5: Analyze structures using Moment Distribution, Kani's Method**(Apply-L4)**

UNIT–I

Energy Theorems: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-Deflections of simple beams and pin jointed plane trusses.

INDETERMINATE TRUSSES: Determination of static and kinematic indeterminacies – Analysis of trusses having single and two degrees of internal and external indeterminacies – Castigliano's second theorem.

UNITII

Three Hinged Arches: Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature. Hinges with supports at different levels.

Two Hinged Arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses, Tied arches – Fixed arches – (No analytical question)

UNIT-III Approximate Methods of Analyses: Application to building frames. (i) Portal Method (ii) Cantilever Method (iii) Substitute frame method for approximate analysis of multi-storey frames subjected to gravity loads and lateral loads. Shear force and bending moment diagrams - Elastic curve.

UNIT – IV Cable Structures and Suspension Bridges: Introduction, characteristics of cable, analysis of cables subjected to concentrated and uniformly distributed loads, anchor cable, temperature stresses, analysis of simple suspension bridge, three hinged and two hinged stiffening girder suspension bridges.

UNIT – V Moment Distribution Method: Analysis of Portal frames – including Sway-Substitute frame analysis by two cycle. Sloped eflection method: Analysis of Portal frames – including Sway. Analysis of inclined frames. Shear force and bending moment diagrams - Elastic curve.

Kani's Method: Analysis of continuous beams–including settlement of supports and single bay portal frames with and without side sway. Shear force and bending moment diagrams - Elastic curve.

TEXT BOOKS:

1 Structural Analysis by R.C. Hibbeler, Pearson, New Delhi.
2 Analysis of Structures- Vol. I and II, V. N. Vazirani and M. M. Ratwani, Khanna Publishers, New Delhi**.**

REFERENCES:

1 Mechanics of Structures Vol – II by H.J.Shah and S.B.Junnarkar, Charotar Publishing House Pvt. Ltd.
2 Structural Analysis by Devdas Menon, Narosa Publishing Housing Pvt. Ltd.
3 Structural Analysis: A Matrix Approach, G.S.Pandit and S.P.Gupta, Mc Graw Hill Pvt Ltd.

B.Tech. (V Sem.) **23CE12-ARCHITECTURE AND TOWN PLANNING**

L	T	P	Cr.
3	0	0	3

Prerequisites: Fundamentals of Civil Engineering

Course Educational Objectives: The course aims to give basic knowledge of different architectures of the world, distinctions between the eastern and western architecture styles. The student able to understand architectural design concepts, principles of planning and composition are imparted and enable the student to understand town planning from ancient times to modern times.

Course Outcomes: On completion of the course, the student should be able to

CO1: Understand the distinguish architectural styles of eastern and western world. **(Understand-L2)**

CO2: Understand the importance of Orders of architecture. **(Understand-L2)**

CO3: Assess the compose spaces of buildings using design concepts, planning principles. **(Understand-L2)**

CO4: Understand the town planning standards, landscaping features and regulations controlling expansion of the towns and the cities. **(Apply-L3)**

UNIT–I

History of Architecture: Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization.

Temples of Religions: Buddhist period: Stambas, Stupas, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Aihole, Madurai, Bhubaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque - Palace - Fort - Tomb.

UNIT-II

Principles of designing and Planning: Principles of planning a residence-site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors.

Post-classic Architecture: Introduction of post-classic architecture-contribution of eminent architects to modern period-Edward Lutyens, Le Corbusier, Frank Lloyd Wrigt, Walter Groping.

UNIT–III

Historical Back Ground of Town Planning: Town planning in India –Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjo- Daro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT–IV

Modern Town Planning: Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning- Neighborhood Planning.

Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation-planning regulations and limitations.

UNIT–V

Land Scaping and Expansion of Towns: Land scaping for the towns, horizontal and vertical expansion of towns-garden cities, satellite towns-floating towns-skyscrapers-pyramidal cities.

TEXT BOOKS:

1. 'The great ages of World Architecture 'by G.K.Hiraskar.
2. 'Planning and Design of Buildings by Section of Architecture' by Y.S.Sane.
3. 'Professional Practice'by G.K. Krishnamurthy, S.V.Ravindra, PHI Learning,New Delhi.
4. 'Indian Architecture–Vol.I&II'byPercy Brown, Taraporevala Publications, Bombay.
5. 'Fundamentals of Town Planning' by G.K.Haraskar.

REFERENCES:

1. 'Drafting and Design for Architecture'by Hepler, Cengage Learning
2. 'Architect's Portable Hand book' by John Patten Guthrie–McGraw Hill International Publications.
3. 'Modern Ideal Homes for India'by R.S.Deshpande.
4. 'Town and County Planning' by A.J.Brown and H.M.Sherrard.
5. 'Town Design'by Federik Glbbard, Architectural press,London.

B.Tech. (V Sem.)	23CE13-CONSTRUCTION TECHNOLOGY & MANAGEMENT	L	T	P	Cr.
		3	0	0	3

Pre-requisites: NIL

Course Educational Objectives: The objective of the course is to introduce the concept of project management including network drawing and monitoring and to illustrate the various equipment related to construction such as earth moving equipment, trucks, aggregate production, construction equipment and machinery. The course also aims to establish the importance of various construction techniques, quality control and safety in construction projects

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

CO1: Appreciate the importance of construction planning and the Stakeholders involved **(Understand-L2)**

CO2: Understand the functioning of various earthmoving equipment and construction techniques **(Understand-L2)**

CO3: Distinguish the methods of production of aggregate products and concreting **(Understand - L2)**

CO4: Apply the project management and construction techniques using CPM and PERT to practical problems **(Apply - L3)**

UNIT-I

Construction project management and its relevance – qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical path method

UNIT-II

Project evaluation and review technique–cost analysis updating crashing for optimum cost–crashing for optimum resources–allocation of resources introduction to software's for construction management, project management using PRIMAVERA (or) equivalent.

UNIT-III

Construction equipment – economical considerations – earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment – calculation of truck production – compaction equipment – types of compaction rollers

Hoisting and earth work equipment–hoists–cranes–tractors-bulldozers–graders–scrapers–draglines-clam shell buckets

UNIT-IV

Concreting equipment— concrete mixers– Batching plants, mobile using plants like "Ajax"etc. mixing and placing of concrete – consolidating and finishing.

UNIT-V

Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering. BIM for Civil Engineers (Building Information Modelling)

TEXTBOOKS:

1. 'Construction Planning, Equipment and Methods' by Peurifoy and Schexnayder, Shapira, Tata McGraw hill.
2. 'Construction Project Management Theory and Practice' by Kumar NeerajJha(2011), Pearson.
3. 'Construction Technology' by Subir K.Sarkar and Subhajit Sarasvati, Oxford University press

REFERENCES:

1. 'Construction Project Management-An Integrated Approach'by Peter Fewings,Taylor and Francis
2. 'Construction Management Emerging Trends and Technologies' by TreforWilliams , Cengage learning

B.Tech. (V Sem.)	23CE14-SAFETY ENGINEERING	L	T	P	Cr.
		3	0	0	3

Pre-requisites: NIL

Course Educational Objectives:

The course aims to identify the causes of accidents related to construction activities and human factors associated with these accidents. The course also deals with the study of construction regulations and quality assurance in construction, gain knowledge in hazards of construction and their prevention methods. The course addresses the basic aspects to be considered in dealing with the health hazards and safety in demolition work.

COURSE OUTCOMES:

On completion of this course, the student will be able to-

CO1: Identify the causes of accidents related to construction activities, role of stakeholders, and human factors associated with these accidents. **(Understand – L2)**

CO2: Recognize the safety requirements in the construction operations and develop guidelines to ensure safety at construction site. **(Understand – L2)**

CO3: Describe and deal with the safety requirements while dealing with machinery and materials during construction. **(Understand – L2)**

CO4: Realize the legal provisions and Acts with respect to the health and welfare of workers at construction site. **(Understand – L2)**

CO5: Identify the appropriate safety and precautionary measures to be taken at a demolition site. **(Understand – L2)**

UNIT I: INTRODUCTION

Introduction to construction industry and safety issues in construction - Human factors in construction safety management - Roles of various groups and stake-holders in ensuring safety in construction industry - Framing of contract conditions on safety and related matters - Relevance of ergonomics in construction safety.

UNIT II: SAFETY IN CONSTRUCTION OPERATIONS

Safety in various construction operations - Excavation and filling - Under- water works Underpinning & Shoring - Ladders & Scaffolds - Tunnelling - Blasting - Dismantling – Confined space - Temporary Structures. noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices. Effects of air pollution in Industry, air pollution episodes; Emission factors inventory and predictive equations. Familiarization with relevant Indian Standards and the National Building Code provisions on construction safety

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UNIT III CONSTRUCTION MACHINERY

Safety in material handling and equipment's - Safety in storage & stacking of construction materials. Safety in the use of construction equipment/vehicles - excavators, graders and dozers - cranes - hoists & lifts - other lifting gears˜ wire ropes - chain-pulley blocks - mixers - conveyors - pneumatic and hydraulic tools in construction. Safety in temporary power supply and fire safety at construction site.

UNIT IV CONSTRUCTION ACT AND CODE OF PRACTICES

Contract Labour (R&A) Act and Central Rules: Definitions, Registration of Establishments, Licensing of Contractors, Welfare and Health provisions in the Act and the Rules, Penalties, Rules regarding wages. Building & Other Construction Work (RE & CS) Act, 1996 and Central Rules, 1998: Applicability, Administration, Registration, Welfare Board & Welfare Fund, Training of Building workers, General Safety, Health & Welfare provisions. Code of Practices - -Preventive measures against Hazards at workplaces Part 1 & 2

UNIT V SAFETY IN DEMOLITION WORK

Safety in demolition work, manual, mechanical, using explosive - keys to safe demolition, pre survey inspection, method statement, site supervision, safe clearance zone, health hazards from demolition - Indian standard - trusses, girders and beams – first aid – fire hazards and preventing methods –Case studies in construction sites against the fire accidents.

TEXT BOOKS

1. Hudson, R., Construction hazard and Safety Hand book, Butter Worth's, 1985.
2. Raymond Elliot Levitt, Nancy Morse Samelson, "Construction Safety Management, McGrawHill, London,1987.

REFERENCES:

1. J. D.Sime, "Safety in the Build Environment", London, 1988.
2. Davies, V. J., and Tomasin, K. (1996). Construction safety handbook. Thomas Telford Publishing, London.
3. Ratay, R. T. (1996). Handbook of temporary structures in construction (2nd Edition, McGrawHill, London.
4. Fulman, J.B., Construction Safety, Security & Loss Prevention, John Wiley and Sons, 1979
5. Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and Central Rules.

B.Tech. (V Sem.) **23CE56-GEOTECHNICAL ENGINEERING LAB**

L	T	P	Cr.
0	0	3	1.5

Pre-requisites: Geotechnical Engineering-I

Course Educational Objective: The course aims to train the students in performing laboratory experiments to find the basic properties soil. The course coverage includes the various field applications of soil.

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

CO1: Perform the index and engineering properties of the soil and interpret the results. **(Apply-L3)**

CO2: Perform the Strength, compaction and consolidation properties of the soil and interpret the results. **(Apply- L3)**

CO3: Apply field conditions for computing and analyzing experimental data. **(Apply-L3)**

LISTOFEXPERIMENTS

(At least **Eight** experiments shall be conducted)

1. Specific gravity, G
2. Atterberg's Limits.
3. Field density-Core cutter and Sand replacement methods
4. Grain size analysis by sieving
5. Permeability of soil-Constant and Variable head tests
6. Compaction test
7. Consolidation test (to be demonstrated)
8. Direct Shear test
9. Triaxial Compression test
10. Unconfined Compression test
11. Vane Shear test
12. Differential free swell (DFS)
13. Field Plate Load Test demo
14. Field CBR demo

LIST OF EQUIPMENT:

1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and shrink age limits
3. Field density apparatus for

a) Core cutter method

b) Sand replacement method

4. Set of sieves: 4.75mm, 2mm, 1mm, 0.6mm, 0.42mm, 0.3mm, 0.15mm, and 0.075mm.
5. Hydrometer
6. Permeability apparatus for

a) Constant head test

b) Variable head test
7. Universal auto compactor fo rI. Slight and heavy compaction tests.
8. Shaking table, funnel for sand raining technique.
9. Apparatus for CBR test
10. 10tons loading frame with proving rings of 0.5 tons and 5tons capacity
11. One dimensional consolation test apparatus with all accessories.
12. Triaxial cell with provision for accommodating 38mm dia specimens.
13. Box shear test apparatus
14. Laboratory vanesh ear apparatus.
15. Hot air ovens (rangeoftemperature50^0-150^0C)
16. Field plate load Test equipment
17. Field CBR test equipment

References:

1. 'Determination of Soil Properties'by J.E.Bowles.
2. IS Code2720 –relevant parts.

B.Tech. (V Sem.)	23CE57-HYDRAULICS AND HYDRAULIC MACHINERY LAB	L	T	P	Cr.
		0	0	3	1.5

Pre-requisites: Mechanics of Fluids, Hydraulics and Hydraulic Machinery Systems

Course Educational Objective:

The student is given hands on training in working on fluid flow hydraulic machinery equipment and performs experiments to verify the principles of fluid mechanics and hydraulics based on laws of conservation of mass, energy, and momentum.

Course Outcomes:

CO1: Demonstrate knowledge on the fundamental principles of fluid flow. **(Apply-L3)**

CO2: Apply the laws of conservation of mass, energy, and momentum to solve practical problems in fluid mechanics. **(Apply-L3)**

CO3: Select the required flow rate, pressure rise and the proper hydraulic turbines and pumps. **(Understand-L2)**

List of Experiments

1. Verification of Bernoullis' equation.
2. Calibration of Venturimeter.
3. Calibration of orificemeter.
4. Determination of coefficient of discharge of a small orifice by constant head method
5. Determination of coefficient of discharge of an external cylindrical mouth piece by variable head method.
6. Calibration of a contracted rectangular notch.
7. Calibration of a triangular notch.
8. Determination of friction factor of the pipe material.
9. Determination of coefficient of dead loss due to a sudden expansion/ contraction in a pipeline.
10. Determination of head loss coefficient due to a bend in pipe line.

TEXT BOOK/REFERENCES

Laboratory manual developed by Civil Engineering Department

B.Tech. (V Sem.)	23CES3-ESTIMATION, SPECIFICATION AND CONTRACTS	L	T	P	Cr.
		0	1	2	2

Pre-requisites: Building planning and drawing Lab, Concrete Technology, Design of concrete structures, Design of steel structures.

Course Educational Objectives:

The objective of this course is to enable the students to:

1. Understand the quantity calculations of different components of the buildings.
2. Understand the rate analysis of different quantities of the buildings components.
3. Learn various specifications and components of the buildings.

Course Outcomes:

Upon successful completion of this course:

CO 1: The student should be able to determine the quantities of different components of buildings.

CO 2: The student should be in a position of find the cost of various building components.

CO 3: The student should be capable of finalizing the value of structures.

UNIT–I

Contracts–Types of contracts–Contract Documents–Conditions of contract, Valuation of buildings- concepts of e-procurement and reverse auctions. Standard specifications for different items of building construction.

UNIT–II

General items of work in Building–Standard Units Principles of working out quantities for detailed and abstract estimates –Approximate method of Estimating.

UNIT–III

Rate Analysis– Working out data for various items of work over head and contingent charges. Earthwork for roads and canals, Reinforcement bar bending and bar requirement schedules.

UNIT-IV

Detailed Estimation of Buildings using individual wall method for single, double and four roomed buildings.

UNIT-V

Detailed Estimation of Buildings using centre line method for single, double and four roomed buildings. Standard software's like building estimator etc.

TEXT BOOKS:

1 'Estimating and Costing' by B.N.Dutta,UBS publishers, 2000.
2 'Civil Engineering Contracts and Estimates' by B.S.Patil, Universities Press (India) Pvt. Ltd., Hyd.

3 'Construction Planning and Technology' by Rajiv Gupta, CBS Publishers & Distributors Pvt. Ltd. New Delhi.
4 'Estimating and Costing'by G.S. Birdie.

REFERENCES:

1 'Standard Schedule of rates and standard data book' by public works department.
2 IS1200 (PartsItoXXV-1974/ Method of Measurement of Building & Civil Engg Works–B.I.S.)
3 'Estimation, Costing and Specifications' by M.Chakraborthi; Laxmi publications.
4 National Building Code

B.Tech. (V Sem.) **23EM01-TINKERING LAB**

L	T	P	Cr.
0	0	2	1

PRE-REQUISITES: Design Thinking and Innovation.

COURSE EDUCATIONAL OBJECTIVE:

The main objective of this course is to understand the basics of all the emerging technologies and apply the learnings to solve real-world problems. This is designed to be a hands-on learning program that empowers students to analyze the facts, connect the dots and apply what they learn in school rather than memorizing them which will lead to the creation of the next generation of entrepreneurs, engineers and innovators.

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

CO1: Turn ideas into reality by brainstorming, modelling and prototyping. **(Applying L3)**

CO2: Inculcate innovative and entrepreneurial mind-set through Design thinking and Hands-on Learning. **(Applying-L3)**

CO3: Develop basic knowledge in electrical and mechanical engineering principles. **(Applying-L3)**

CO4: Develop skills of using hand tools to construct a prototype of an engineering design. **(Applying L3)**

List of Experiments

1. Make your own parallel and series circuits using breadboard for any application of your choice.
2. Demonstrate a traffic light circuit using breadboard.
3. Build and demonstrate automatic Street Light using LDR.
4. Simulate the Arduino LED blinking activity in Tinkercad.
5. Build and demonstrate an Arduino LED blinking activity using Arduino IDE.
6. Interfacing IR Sensor and Servo Motor with Arduino.
7. Blink LED using ESP32.
8. LDR Interfacing with ESP32.
9. Control an LED using Mobile App.
10. Design and 3D print a Walking Robot
11. Design and 3D Print a Rocket.
12. Build a live soil moisture monitoring project, and monitor soil moisture levels of a remote plan in your computer dashboard.
13. Demonstrate all the steps in design thinking to redesign a motor bike.

REFERENCE BOOKS: Lab Manual

WEB REFERENCES: Students need to refer to the following links:

1) https://aim.gov.in/pdf/equipment-manual-pdf.pdf
2) https://atl.aim.gov.in/ATL-Equipment-Manual/
3) https://aim.gov.in/pdf/Level-1.pdf
4) https://aim.gov.in/pdf/Level-2.pdf
5) https://aim.gov.in/pdf/Level-3.pdf

B.Tech. (VI Sem.)	23CE15-DESIGN AND DRAWING OF STEEL STRUCTURES	L	T	P	Cr.
		3	0	0	3

Pre-requisites: Strength of Materials-I, Strength of Materials-II, and Structural Analysis

Course Educational Objectives:

This course serves as introduction to the concepts of structural steel design using IS 800 design code. It deals with the design of individual members and connections, such as, the design of tension members, compression members, beams, and beam columns; roof trusses and bolted, welded, and connections. The primary objective is to equip the students with the tools necessary for designing steel structures and to familiarize them with there relevant national design codes

Course Outcomes:

CO1: Design the different types of connections (Riveted and Welded) in steel members **(Apply-L3)**

CO2: Design of Simple and compound beams and check its stability as per IS code **(Apply-L3)**

CO3: Design of Tension, compression members **(Apply-L3)**

CO4: Design of compression members, column bases subjected to point loads and moments **(Apply-L3)**

CO5: Design of Plate girder and Gantry Girder **(Apply-L3)**

UNIT – I

Connections: Riveted connections – definition, rivet strength and capacity, Welded connections: Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds: 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.

UNIT – II

Beams: Allowable stresses, design requirements as per IS Code-Design of simple and compound beams-Curtailment of flange plates, Beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally unsupported beams.

UNIT –III

Tension Members and compression members: Effective length of members, slenderness ratio-permissible stresses. Design compression members subjected to axial and eccentric loading. Design of members subjected to direct tension and bending. **Roof Trusses:** Different types of roof trusses – Design loads – Load combinations as per IS Code recommendations, structural details –Design of purlins, members and joints.

UNIT – IV

Design of Columns: Built up compression members – Design of lacings and battens. Design Principles of Eccentrically loaded columns, Splicing of columns.

Design of Column Foundations: Design of slab base and gusseted base. Column bases subjected to moment.

UNIT – V

Design of Plate Girder: Design consideration – IS Code Recommendations Design of plate girder-Welded – Curtailment of flange plates, stiffeners – splicing and connections.

Design of Gantry Girder: impact factors - longitudinal forces, Design of Gantry girders.

NOTE: Welding connections should be used in Units II – V. Drawing classes must be conducted every week and the students should prepare the following plates.

Plate 1 Detailing of simple beams
Plate 2 Detailing of Compound beams including curtailment of flange plates.
Plate 3 Detailing of Column including lacing and battens.
Plate 4 Detailing of Column bases – slab base and gusseted base
Plate 5 Detailing of steel roof trusses including joint details.
Plate 6 Detailing of Plate girder including curtailment, splicing and stiffeners.
Plate 7 Detailing of gantry girder.

TEXTBOOKS

1. 'Steel Structures Design and Practice' by N.Subramanian, Oxford University Press.
2. 'Design of Steel Structures' by Ramachandra, Vol – 1, Universities Press.
3. 'Design of steel structures' by S.K. Duggal, Tata Mcgraw Hill, and New Delhi

REFERENCES

1. 'Structural Design in Steel' by SarwarAlamRaz, New Age International Publishers, New Delhi
2. 'Design of Steel Structures' by P. Dayaratnam; S. Chand Publishers
3. 'Design of Steel Structures' by M. Raghupathi, Tata Mc. Graw-Hill
4. 'Structural Design and Drawing' by N. Krishna Raju; University Press,

B.Tech. (VI Sem.) **23CE16-HIGHWAY ENGINEERING**

L	T	P	Cr.
3	0	0	3

Prerequisites: Fundamentals of Civil Engineering, Surveying

Course Educational Objectives: The course aims to introduce the principles and practices of highway engineering like geometric elements, design, construction materials and techniques, traffic engineering. The student will be able to design the various types of pavements and control traffic generate on the highways with both theoretical knowledge and practical understanding aligned with national standards.

Course Outcomes: On completion of the course, the student should be able to
CO1: Understand the fundamentals of planning, development, geometric elements, maintenance strategies and traffic parameters of highway. (Understand-L2)
CO2: Determine the geometric elements of highway in accordance with IRC Standards for the effective road layout. (Apply-L3)
CO3: Identify the suitable highway materials based on their physical and mechanical properties. (Understand-L2)
CO4: Design the elements of highway in accordance with the IRC standards. (Apply-L3)

UNIT-I

Highway Planning and Alignment: Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans– First, second, third road development plans, road development vision 2021,Rural Road Development Plan – Vision 2025; Planning Surveys; Highway Alignment- Factors affecting Alignment-Engineering Surveys – Drawings and Reports.

UNIT – II

Highway Geometric Design: 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.

UNIT – III

Traffic Engineering: Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies; Speed studies –spot speed and speed & delay studies; Parking Studies; Road Accidents-Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals –Webster Method –IRC Method.

UNIT –IV

Highway Materials: Sub grade soil: classification –Group Index–Subgrade soil strength – California Bearing Ratio–Modulus of Subgrade Reaction. Stone aggregates: Desirable properties– Tests for Road Aggregates–Bituminous Materials: Types–Desirable properties—Testson Bitumen -Bituminous paving mixes: Requirements – Marshall Method of Mix Design

UNIT–V

Design of Pavements: Types of pavements; Functions and requirements of different components of pavements; Design Factors

Flexible Pavements*:* Design factors–Flexible Pavement Design Methods–CBR method–IRC method–Burmister method–Mechanistic method–IRC Method for Low volume Flexible pavements.

Rigid Pavements: Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses–Combination of stresses–Design of slabs–Design of Joints–IRC method–Rigid pavements for low volume roads – Continuously Reinforced Cement Concrete Pavements – Roller Compacted Concrete Pavements.

TEXTBOOKS:

1. "Highway Engineering", Khanna S.K., Justo C.E.G and Veeraragavan A,Nem Chand Bros., Roorkee.
2. "Traffic Engineering and Transportation Planning", KadiyaliL. R,Khanna Publishers, New Delhi.

REFERENCES:

1. "Principles of Highway Engineering", KadiyaliL .R,Khanna Publishers, NewDelhi
2. "Principles of Transportation Engineering", Partha Chakraborty and Animesh Das,PHI Learning Private Limited, Delhi

B.Tech. (VI Sem.) **23CE17-ENVIRONMENTAL ENGINEERING**

L	T	P	Cr.
3	0	0	3

Pre-requisites: Environmental Studies, Engineering Chemistry

Course Educational Objectives: The course aims to introduce the planning and the design of water supply systems for a community/town/city. It addresses the quality and quantity aspects involved in the water quality requirement for specific usage and basics involved in the design of water distribution network. The course deals with the planning and design of Sewerage System for a community/town/city and appropriate disposal of wastewater after its treatment.

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

CO1: Identify the appropriate source of water based on quality and quantity requirements and evaluate the methods of appropriate distribution of water **(Understand – L2)**

CO2: Recognize the major quality parameters of water and wastewater and interpret their impacts on receiving environment **(Understand-L2)**

CO3: Recognize the principles of water treatment operations and compute the design calculations **(Apply-L3)**

CO4: Realize the principles of sewerage systems, wastewater treatment operations, and compute the design calculations **(Apply-L3)**

CO5: Identify the appropriate sewage disposal options and understand the fundamentals of advanced wastewater treatment **(Understand-L2)**

UNIT–I

Introduction: Importance and Necessity of Protected Water Supply systems. Water borne diseases. Planning of public water supply systems. Per capita demand and factors influencing it, types of water demands and its variations, factors affecting water demand, Design Period, Factors affecting the Design period, estimation of water demand for a town or city, Population Forecasting.

Sources of Water: Various surface and subsurface sources considered for water supply and their comparison- Capacity of storage reservoirs, Conveyance of Water from the source to the point of interest: Gravity and Pressure conduits, Types of Pipes and Pipe joints.

UNIT-II

Quality and Analysis of Water: Physical, Chemical and Biological characteristics of water. Water quality criteria for different uses- Rural, Municipal, Industrial and Agricultural uses. Drinking water quality standards: IS and WHO guidelines.

Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks: Hardy Cross and equivalent pipe methods – Appurtenances of water distribution system–Laying and testing of pipe lines.

UNIT-III

Treatment of Water: Typical treatment flow of a municipal water treatment plant, Unit operations of water treatment: Theory and Design of Sedimentation, Coagulation, flocculation, Filtration, Water conditioning and softening, Disinfection, Removal of color and odors – Removal of Iron and manganese – Fluoridation and De-fluoridation –Ion Exchange - Ultra filtration- Reverse Osmosis.

UNIT-IV

Planning and Design of Sewerage System

Characteristics and composition of sewage — population equivalent -Sanitary sewage flow estimation — Sewer materials — Hydraulics of flow in sanitary sewers — Sewer design — Storm drainage-Storm runoff estimation — sewer appurtenances — corrosion in sewers — prevention and control — sewage pumping-drainage in buildings-plumbing systems for drainage Primary Treatment of Sewage

Objectives — Unit Operations and Processes — Selection of treatment processes — Onsite sanitation — Septic tank- Grey water harvesting — Primary treatment — Principles, functions and design of sewage treatment units — screens — grit chamber-primary sedimentation tanks — Construction, Operation and Maintenance aspects.

UNIT–V

Secondary Treatment of Sewage

Objectives — Selection of Treatment Methods — Principles, Functions, — Activated Sludge Process and Extended aeration systems -Trickling filters– Sequencing Batch Reactor (SBR) — Membrane Bioreactor — UASB — Waste Stabilization Ponds — Other treatment methods - Reclamation and Reuse of sewage — Recent Advances in Sewage Treatment — Construction, Operation and Maintenance aspects.

Disposal of Sewage

Standards for– Disposal — Methods — dilution — Mass balance principle — Self purification of river - Oxygen sag curve — de-oxygenation and re-aeration — Streeter–Phelps model — Land disposal — Sewage farming — sodium hazards — Soil dispersion system.

TEXT BOOKS

1. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – McGraw-Hill Book Company, New Delhi, 1985.
2. Water Supply Engineering. Dr. P.N. Modi, Standard Book House, Delhi.

REFERENCES

1. Elements of Environmental Engineering – K.N. Duggal, S. Chand & Company Ltd., New Delhi.
2. Water Supply Engineering.– Dr. B.C. Punmia, A.K. Jain and A.K. Jain. Laxmi Publications (P) Ltd., New Delhi.
3. Water Supply and Sanitary Engineering – G.S. Birdie and J.S. Birdie

B.Tech. (VI Sem.) **23CE18-GROUND IMPROVEMENT TECHNIQUES**

L	T	P	Cr.
3	0	0	3

Pre-requisites: Geotechnical Engineering-I

Course Educational Objective: The course aims to teach the different ground improvement methods adopted for improving the properties of remolded and in-situ soils by adopting different techniques such as in situ densification and dewatering methods.

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

CO1: Understand the knowledge of various densification methods of ground improvement and their suitability to different field situations. **(Understand-L2)**

CO2: Understand the dewatering and well points techniques to improve the ground. **(Understand-L2)**

CO3: Understand the different types of stabilization methods and grouting techniques to improve the ground. **(Understand-L2)**

CO4: Understand the concept and principles of Reinforced earth to stabilize the ground. **(Understand-L2)**

CO5: Understand the various functions of Geosynthetics and their applications in Civil Engineering practice. **(Understand-L2)**

UNIT-I

In situ densification methods- in situ densification of granular soils- vibration at ground surface and at depth, impact at ground and at depth – insitu densification of cohesive soils – pre loading – vertical drains – sand drains and geo drains – stone columns.

UNIT-II

Dewatering–sumps and interceptor ditches –single and multi-stage well points–vacuum well points, horizontal wells – criteria for choice of filler material around drains – electro osmosis

UNIT- III

Stabilization of soils – methods of soil stabilization – mechanical – cement – lime – bitumen and polymer stabilization–use of industrial wastes like fly a shand granulated blast furnace slag.

Grouting – objectives of grouting – grouts and their applications – methods of grouting – stage of grouting–hydraulic fracturing in soils and rocks –post grouttests. Introduction to Liquefaction & its effects & applications.

UNIT-IV

Reinforce earth–principles–components of reinforced earth–design principles of reinforced earth walls – stability checks – soil nailing.

UNIT-V

Geosynthetics–geotextiles–types–functions, properties and applications – geogrids, geomembranes and gabions - properties and applications.

TEXT BOOKS:

1. 'Ground Improvement Techniques' by Purus Hotham Raj, Laxmi Publications, New Delhi.
2. 'Ground Improvement Techniques' by Nihar Ranjan Patro,Vikas Publishing House(p) limited ,New Delhi.
3. 'An introduction to Soil Reinforcement and Geosynthetics' by G.L.Siva Kumar Babu, Universities Press.

REFERENC EBOOKS:

1. 'Ground Improvement 'by MP Moseley, Blackie Academic and Professional, USA.
2. 'Designing with Geosynethetics 'by RM Koerner, Prentice Hall

B.Tech. (VI Sem.)	20CE19-LOW-COST AND ECO-FRIENDLY BUILDING TECHNIQUES	L	T	P	Cr.
		3	0	0	3

Pre-requisites: Building Materials and Construction, Concrete Technology

Course Educational Objectives:

The course provides the knowledge on traditional and eco-friendly materials, Eco friendly and cost-effective technologies, Eco-friendly building materials, rural housing approaches in disaster prone areas.

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

CO1: Illustrate the concepts of traditional building materials and eco-friendly building materials for construction. **(Understand - L1)**

CO2: Understand the developments of building technologies in foundations, walls and roofs. **(Understand-L2)**

CO3: Describe prefabrication techniques and assess the wind effects on low rise buildings. **(Understand-L2)**

CO4: Demonstrate the construction of houses in rural areas and disaster prone areas. **(Understand-L2)**

UNIT-I

Traditional Building Materials:

Introduction-housing scenario in India, Traditional building materials-stabilized soil bricks, improved mud and thatch, burnt and un burned bricks, laterite-lime bricks, sand-lime blocks, stone block masonry units, bamboo, hollow cement blocks, light weight concrete blocks, wood-cement products, fly ash bricks, cementitious binder from rice husk, lime based binders.

UNIT-II

Eco-Friendly Building Materials:

Basics and practical applications of locally available building materials- Soil, Fly ash, Ferrocement, Lime, Fibres, Stone Dust, Red mud, Gypsum, Alternate Wood, Polymer-ADOBE, Light Clay, Straw-Bale, Bamboo, Agro-Industrial Waste, Innovative materials developed by CBRI, SERC, Structural Properties of Alternate Building Materials, Earthen Finishes, Earth Plasters, Earth Floors.

UNIT-III

Improved Building Technologies

Foundations:

Introduction, types of soli, types of foundations, permissible settlements, soil investigations.

Walls:

Introduction, stabilized earth wall construction, building blocks (lato blocks) from lateritic soil, brick masonry walls, cellular concrete blocks, hallow concrete blocks, shell type houses made of hallow clay blocks, pre cast concrete panels.
Roofs:
Introduction, catenary hollow clay blocks/brick shell roofs, pre cast reinforced concrete-channel units-cored units, roofing system with cellular unit, cellular light weight concrete roofing system.

UNIT-IV

Pre-fabrication:

Introduction, advantages of pre-fabrication, areas where prefabrication techniques can be introduced, joints in pre cast concrete structures.
approval; Technical sanction; Plinth area; Floor Area; Carpet area; Approximate Estimate; Plinth area estimate; Revised Estimate; Supplementary estimate.

Wind effects on low rise buildings:
Introduction, wind structure interaction concepts, codal provision, housing in cyclone prone areas, cyclone resisting core units.

UNIT-V

Rural housing:

Introduction, traditional practice of rural house construction, appropriate rural housing technology, mud housing technology, mud roofs, characteristics of mud, fire retardant treatment for trench roof.
Housing in disaster prone areas:
Introduction, traditional houses in disaster prone areas, types of damages failures of non engineered buildings, repair and rehabilitation of earthquake damaged non engineered buildings, recommendations for feature construction.

Text Books:

1. A.G.Madhavrao, D.S.Ramachandramurthy –Appropriate technologies for low cost housing-oxford & IBH Publishing, 1996.
2. A K Lal, “Hand Book of Low Cost Housing”, New Age Publishing, 1995.

References:

1. N. Kumara Swamy and A. Kameswara Rao, “Building Planning and Drawing”, Charotar Publications, 2013.
2. S K Duggal, “Building materials”, New Age International Publishers. 2012.

B.Tech. (VI Sem.)	20CE20-REPAIR AND REHABILITATION OF STRUCTURES	L	T	P	Cr.
		3	0	0	3

Pre-requisites: Building Materials and Construction, Concrete Technology

Course Educational Objectives:

The course provide to acquire the knowledge on Quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

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

CO1: Understand the mechanisms of degradation of concrete structures. **(Understand-L2)**

CO2: Design and suggest repair strategies for deteriorated concrete structures including Repairing with composites. **(Apply-L3)**

CO3: Select appropriate repair material and rehabilitation strategy. **(Understand – L2)**

CO4: Describe the application and use of fiber reinforced concrete, high performance concrete and self compacting concrete. **(Understand – L2)**

UNIT:I

Materials for repair and rehabilitation-Admixtures-types of admixtures-purposes of using admixtures-chemical composition-Natural admixtures-Fibers-wraps-Glass and Carbon fiber wraps-Steel Plates-Nondestructive evaluation :Importance-Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects –Visual investigation-Acoustical emission methods-Corrosion activity measurement- chloride content–Depth of carbonation-Impact echo methods-Ultra sound pulse velocity methods- pull out tests.

UNIT:II

Strengthening and stabilization-Techniques-design considerations-Beam shear capacity strengthening- Shear Transfer strengthening-stress reduction techniques- Column strengthening-flexural strengthening-Connection stabilization and strengthening, Crack stabilization.

UNIT:III

Bonded installation techniques-Externally bonded FRP-Wetlay upsheet, bolted plate, near surface mounted FRP, fundamental debonding mechanisms-intermediate crack debonding-CDC debonding-plate end de bonding-strengthening of floor of structures post grout tests. Introduction to Liquefaction & its effects & applications.

UNIT:IV

Fiber reinforced concrete-Properties of constituent materials-Mix proportions, mixing and casting methods-Mechanical properties of fiber reinforced concrete-applications of fiber reinforced concretes-Light weight concrete-properties of light weight concrete-No fines concrete-design of light weight concrete-Fly ash concrete-Introduction-classification of fly ash-

properties and reaction mechanism of fly ash-Properties of fly ash concrete in fresh state and hardened state-Durability of fly ash concretes

UNIT:IV

High performance concretes-Introduction-Development of high-performance concretes-Materials of high performance concretes-Properties of high performance concretes-Self Consolidating concrete-properties-qualifications.

TEXT BOOKS

1. Maintenance Repair Rehabilitation & Minor works of Buildings -P.C.Varghese, PHI Publications
2. Repair and Rehabilitation of Concrete Structures–P.I.Modi,C.N.Patel,PHI Publications
3. Rehabilitation of Concrete Structures-B.Vidivelli,Standard Publishers Distributors
4. Concrete Bridge Practice Construction Maintenance & Rehabilitation-V.K.Raina, Shroff Publishers and Distributors.

REFERENCE:

1. Concrete Technology Theory and Practice-M.S.Shetty,SChandand Company
2. Concrete Repair and Maintenance illustrated-PeterHEmmons
3. Concrete Chemical Theory and Applications-Santa Kumar A.R.,Indian Society for Construction Engineering and Technology, Madras
4. Hand book on Repair and Rehabilitation of RC buildings published by CPW, Delhi

B.Tech. (VI Sem.)	23CE21-VALUATION AND QUANTITY SURVEY	L	T	P	Cr.
		3	0	0	3

Pre-requisite: Construction Management, DRCS, Transportation Engineering, Building Materials and Construction, and Foundation Engineering.

Course Educational Objectives (CEOs): This course aims to deal with the basic principles of Valuating the quantities in building, roads and canals. The course also provides details about the procedures and practices for writing specifications, preparation of analysis of rates and procedural aspects of valuating the property.

COURSE OUTCOMES (COs): At the end of the course, students are able to

CO1: Estimate the quantities for various types of structures and contract document. **(Apply)L3**

CO2: Calculate the quantities of different items in buildings and roads from drawings and explain its general specification and rate analysis. **(Apply)L3**

CO3: Prepare detailed measurements (including BBS) and BoQ of various work like buildings, earth work for road, sanitary and water supply work. **(Understanding)L2**

CO4:Perform valuation of land buildings using different methods of valuation. **(Understanding)L2**

UNIT I

Introduction- Quantity Surveying- Basic principles, Role/responsibility of Quantity surveyor at various stages of construction. Estimate-Details required, Type of estimate, purposes. Contingencies, Work-charge establishment, Tools and Plant, centage charge, Day work, Prime cost, Provisional sum & provisional Quantity, Overhead charges, Cost index, Contract documents (Brief description only)Bill of Quantity-Typical format-use Item of works- Identify various item of work from the drawings- units of measurement of various materials and works (focus may give to RCC residential building) General rule & method of measurement with reference to Indian Standard Specifications- IS1200.

UNIT II

Introduction to the use of CPWD schedule of rates as per latest DSR and Analysis of rate as per latest DAR. Specifications-General specification of all items of a residential building. Detailed specification (CPWD specifications) of major item of work like Earth work excavation in foundation, masonry, Reinforced cement concrete, finishing of building work Analysis of rates for Earth work in excavation for foundation, mortars, reinforced cement concrete Works, finishing work, masonry work, stone works, flooring with reference to latest DSR and latest DAR (Data should be given).

UNIT III

Detailed Estimate- Preparation of detailed measurement using Centre line method & Short wall long wall (separate wall) method for RCC single storied building (Flat roof) including stair cabin- Residential/office/school building. BOQ preparation of a single storied RCC building work. Material quantity calculation of the items of work (Rubble, Brick work, Concrete work, Plastering) in detailed estimate prepared for building work. (Data for unit quantity should be provided from DAR)

UNIT IV.

Bar Bending Schedule- Preparation of BBS of RCC beams, slabs, Column footings, Retaining wall. Road estimation-Estimation of earth work from longitudinal section-metaled road.Estimation of sanitary and water supply work -Water tank, Septic tank, Manhole *(No Detailed estimate needed-concept of item of work, its general specification and unit of measurement*).(Valuation – purpose, factor affecting, introduction to terms-Value, Cost, Price, kinds of values Income- Gross income, net income, outgoings, annuity, sinking fund, Year's purchase, Depreciation, obsolescence -Free hold and leasehold properties.)

UNIT V

Methods of calculating depreciation – straight line method – constant percentage method, sinking fund method and quantity survey method.

Methods of valuation–rental method, direct comparison of capital cost, valuation based on profit, depreciation method. Various method of valuation of land (Brief description only)

Text Books:

1. B.N.Dutta, Estimation and costing in civil engineering, UBS publishers
2. Rangwala, Estimation Costing and Valuation, Charotar publishing house pvt.ltd
3. Dr. S. Seetha Raman, M.Chinna swami, Estimation and quantity surveying, Anuradha publications Chennai.
4. M Chakraborthy, Estimating, Costing, Specification and valuation, published by the author, 21 B, Babanda Road, Calcutta 26

References:

1. BS Patil, Civil Engineering contracts and estimates, university press
2. V N Vazirani & S P Chandola, Civil Engineering Estimation and Costing, Khanna Publishers
3. IS1200-1968; Methods of measurement of building & civil engineering works
4. CPWDDAR 2018 and DSR 2018 or latest
5. CPWD Specifications Vol1&2 (2019 or latest edition)

B.Tech. (VI Sem.) **23CE22-GREEN BUILDINGS**

L	T	P	Cr.
3	0	0	3

Prerequisites: Building Materials, Environmental science, Environmental Engineering

Course Educational Objectives: The course includes the concept of green buildings, their benefits, features and the rating systems of green buildings in India and U.S. Also it covers reduction in energy consumption of buildings, and efficiency of HVAC systems. It also covers material conservation, renewable energy resources, waste reduction and Improving air quality in indoor environment.

Course Outcomes:

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

CO1: Describe the need, benefits and key features of green buildings **(Understand – L2).**

CO2: Understand the green building rating concept and energy efficiency in green buildings **(Understand – L2)**.

CO3: Identify the importance of energy demand reduction in the design of green buildings. **(Understand – L2)**

CO4: Describe the requirements of different energy units installation and operation by referring to suitable case studies of green buildings. **(Understand – L2)**

CO5: Understand the waste management and methods for improving air quality in green buildings **(Understand – L2)**

UNIT - I: GREEN BUILDINGS CONCEPT

Definition of Green Buildings, typical features of green buildings, benefits and environmental impacts of Green Buildings, Brown field and green field development, sustainable site selection and planning of buildings to maximize comfort, day lighting, ventilation.

UNIT - II: GLOBAL WARMING AND CLIMATE DESIGN

Global Warming – Definition - Causes and Effects - Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon.

Local climatic conditions – solar radiation, temperature, humidity, wind speed and direction-impact of deforestation and climate change on built environment, desirable conditions, Fresh air requirements, standards, sick building syndrome and indoor air pollutants.

UNIT - III: GREEN MATERIALS

Recycling of building materials, Advantages in usage of natural local materials such as bamboo, timber, rammed earth, stabilized mud blocks, hollow blocks, lime & lime-pozzolana cements, materials from agro and industrial waste, ferro-cement and ferro-concrete, alternative roofing systems, various paints reducing the heat gain of the building, etc.

UNIT-IV: ENERGY AND RESOURCE CONSERVATION

Building envelope – its parts and types, Active and passive energy systems, need for energy conservation, Various forms of energy used in buildings, energy used in transportation and construction processes- Building automation and building management systems. Principles of thermal design - means of thermal –light and lighting-building acoustics- energy efficient lighting,

Ventilation and indoor air quality. Water conservation systems in buildings- planning for storm water drainage, water harvesting in buildings.

UNIT-V: RENEWABLE ENERGY AND GREEN BUILDING RATING SYSTEMS

Wind and Solar Energy Harvesting, Potential of solar energy in India and world, construction and operation of various solar and wind energy-based appliances, Geothermal energy usage in buildings, Case studies. Introduction to Leadership in Energy and Environment Design (LEED), Green rating systems for Integrated Habitat Assessment – GRIHA, IGBC ratings, Salient features of Green buildings constructed in India.

TEXT BOOKS:

1. K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao, "Alternative building materials and technologies", New Age International, 2014.
2. N. Kumara Swamy and A. Kameswara Rao, "Building Planning and Drawing", Charotar Publications, 2013.

REFERENCES

1. Abe Kruger and Carl Seville, "Green Building: Principles and Practices in Residential
2. Construction", Demar Cengage Learning, 2012.
3. G.D. Rai, "Non-Conventional Energy Resources", Khanna Publishers; 18th edition, 2017.
4. Koenigsberger O H, "Manual of Tropical Housing and Building", 1st edition, Orient Longman Publishers, Chennai, 2003.
5. Odom P. Eugene, "Ecology and Environment", 2nd edition, Oxford and IBH Publishers,
   New Dehi, 2005.

B.Tech. (VI Sem.) **23CE23-FINITE ELEMENT METHOD**

L	T	P	Cr.
3	0	0	3

Prerequisites: Strength of Materials-I, Strength of Materials-II, Structural Analysis

Course Educational Objectives: The aim of the course is to provide the participants with an overview on Finite Element Method, Material models, and Applications in Civil Engineering. At the end of the course, the participants are expected to have fair understanding of Basics of Finite Element Analysis, Importance of interfaces and joints on the behavior of engineering systems and Implementation of material model in finite element method and applications

Course Outcomes:

CO1: Develop finite element formulations of 1degree of freedom problems and solve Them **(Understand – L2).**

CO2: Understand any Finite Elements of ware to perform stress, thermal and modal Analysis **(Understand – L2)**.

CO3: Compute the stiffness matrices of different elements and system **(Apply –L3)**

CO4: Interpret displacements, strains and stress resultants **(Apply –L3)**

CO5: Analyze planar structural systems using finite element modeling **(Apply –L3)**

UNIT I

Introduction: Review of stiffness method-Principle of Stationary potential energy-Potential energy of anelastic body-Rayleigh-Ritz method of functional approximation-variational approaches- weighted residual methods

UNIT II

Finite Element formulation of truss element: Stiffness matrix-properties of stiffness matrix –Selection of approximate displacement functions-solution of a planetruss-transformation matrix and stiffness matrix for a 3-D truss- Inclined and skewed supports-Galerkin's methodfor1-Dtruss– Computation of stress in a truss element.

UNIT III

Finite element formulation of Beam elements: Beam stiffness-assemble age of beam stiffen matrix- Examples of beam analysis for concentrated and distributed loading-Galerkin's method – 2 Darbitrarily oriented beam element–inclined and skewed supports–rigid plane frame examples

UNIT IV

Finite element formulation for plane stress, plane strain and axi symmetric problems-Derivation of CST and LST stiffness matrix and equations-treatment of body and surface forces-Finite Element solution for plane stress and axi-symmetric problems-comparison of CST and LST elements– convergence of solution-interpretation of stresses

UNIT V

Iso-parametric Formulation: Iso-parametric bar element- plane bilinear Iso-parametric element – quadratic plane element-shape functions, evaluation of stiffness matrix, consistent modalload vector- Gauss quadrature-appropriate order of quadrature–element and mesh instabilities– spurious zero energy modes, stress computation-patch test.

TEXTBOOKS

1. A first course in the Finite Element Method–Daryl L.Logan, Thomson Publications.
2. Concepts and applications of Finite Element Analysis–Robert D.Cook, Michael EPlesha, JohnWiley & Sons Publications

REFERENCES:

1. Introduction to Finite Elements in Engineering-Tirupati R.Chandrupatla, Ashok D. Belgunda, PHI publications.
2. Finite Element Methods (For Structural Engineers)Wail N Rifaie, Ashok K Govil, New Age International(P)Limited

B.Tech. (VI Sem.) **23CE24-BRIDGE ENGINEERING**

L	T	P	Cr.
3	0	0	3

Pre-requisite: Design of Reinforced Concrete Structures & Design of Steel Structures

Course Educational Objective: Familiarize students with different types of Bridges and IRC standards. Equip student with the concepts and design of Slab Bridges, T Beam Bridges, Box Culverts. Understand concepts of design of Plate Girder Bridges. Familiarize with different methods of inspection of bridges and their maintenance

Course Outcomes:

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

CO1: Understand the different types of Bridges with diagrams and Loading standards. **(Understand-L2)**

CO2: Evaluate the analysis and design of Slab bridges, T Beam bridges, Box culvers and suggest structural detailing. **(Apply-L3)**

CO3: Evaluate the analysis and design of Plate girder bridges. **(Apply-L3)**

CO4: Understand the attending inspections and maintenance of bridges and prepare reports. **(Understand-L2)**

UNIT-I

General Introduction to types of Bridges- (Slab bridges, TBeam, Arch bridges, Cable Stayed bridges, pre stressed concrete bridges, Truss Bridges, Culverts) - Nomenclature- Selection of Bridge Site- Economical span- Abutments pier and end connections- types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading

UNIT-II

Slab bridges- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs-dispersion length-Design of interior panel of slab-Guyon's–Massonet Method–Hendry-Jaegar Methods- Courbon's theory- Pigeaud's method

UNIT-III

T-Beam bridges- Analysis and design of various elements of bridge–Design of deck slab, longitudinal girders, Secondary beams- Reinforcement detailing

UNIT-IV

Plate Girder Bridges: Elements of plate girder and their design-web- flange- intermediate stiffener- vertical stiffeners- bearing stiffener- Splices, Design problem with detailing.

UNIT-V

Box Culverts: Loading–Analysis and Design-Reinforcement detailing.

Inspection and Maintenance of Bridges: Procedures and methods for inspection–Testing of bridges- Maintenance of Sub Structures and Super structures-Maintenance of bearings-Maintenance Schedules.

TEXTBOOK

1. 'Essentials of Bridge Engineering 'by Johnson Victor D
2. 'Design of Bridge Structures' by T.R. Jagadeesh, M.A. Jayaram, PHI
3. 'Design of RC Structures' by B. C.Punmai, Jain & Jain, Lakshmi Publications

REFERENCES:

1. 'Design of Concrete Bridges' by Aswini, Vazirani,Ratwani
2. 'Design of Steel Structures' by B.C.Punmai, Jain & Jain, Lakshmi Publications
3. 'Design of Bridges' by Krishna Raju

B.Tech. (VI Sem.) **23CE25-WATER RESOURCES ENGINEERING**

L	T	P	Cr.
3	0	0	3

Pre-requisites: Engineering Hydrology, Fluid Mechanics

Course Educational Objectives:

The course allows the student to learn the types of irrigation systems, understand the concepts of planning and design of irrigation systems, relationships among soil, water and plant and their significance in planning an irrigation system, design principles of erodible and non-erodible canals. The student is able to know the principles of design of weirs on permeable foundations, analyse and design of storage head works and design principles of canal structures.

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

CO1: Estimate irrigation water requirements. **(Understand-L2)**
CO2: Design irrigation canals. **(Apply-L3)**
CO3: Design irrigation canal structures. **(Understand-L2)**
CO4: Plan and design diversion head works. **(Apply-L3)**
CO5: Analyze stability of gravity and earth dams. Design of hydraulic ogee spillways. **(Apply-L3)**

UNIT-I

Irrigation: Necessity and importance, principal crops and crop seasons, types, methods of application, soil-water-plant relationship, soil moisture constants, consumptive use, estimation of consumptive use, crop water requirement, duty and delta, factors affecting duty, depth and frequency of irrigation, irrigation efficiencies, water logging and drainage, standards of quality for irrigation water, crop rotation.

UNIT-II

Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible canals -Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting.

UNIT- III

Canal Structures:

Falls: Types and location, design principles of Sarda type fall and straight glacis fall. (Description only)

Regulators: Head and cross regulators, design principles (Description only)

Cross Drainage Works: Types, selection, design principles of aqueduct, siphon aqueduct and super passage. (Description only)

Outlets: Types, proportionality, sensitivity and flexibility

River Training: Objectives and approaches

UNIT-IV

Diversion Head Works: Types of diversion head works, weirs and barrages, layout of diversion head works, components. causes and failures of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, design of impervious floors for subsurface flow, exit gradient.

UNIT-V

Reservoir Planning: Investigations, site selection, zones of storage, yield and storage capacity of reservoir, reservoir sedimentation.

Dams: Types of dams, selection of type of dam, selection of site for a dam.

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 dam, stability analysis.

Earth Dams: Types, causes of failure, criteria for safe design, seepage, measures for control of seepage-filters.

Spillways: Types, design principles of Ogee spillways, types of spillways crest gates.

TEXTBOOKS:

1. 'Irrigation and Waterpower Engineering' by Punmia B C, P.B.B Lal, A.K. Jain and A.K. Jain (2009), Laxmi Publications Pvt. Ltd., New Delhi
2. 'Irrigation and Water Resources Engineering' by Asawa G L (2013), New Age International Publishers
3. 'Irrigation Engineering' by Raghunath H.M (2012), Wiley India.
4. 'Irrigation Water Resources and Waterpower Engineering' by Modi P N (2011), Standard Book House, New Delhi

REFERENCES:

1. 'Water Resources Engineering' by Mays L.W (2013), Wiley India Pvt. Ltd, New Delhi.
2. 'Irrigation Engineering' by Sharma R.K. and Sharma, T. K (2012), S. Chand & Co Publishers.
3. 'Water Resources Engineering' by Satyanarayana Murthy Challa (2008), New Age International Publishers.

B.Tech. (VI Sem.)	23CE58-ENVIRONMENTAL ENGINEERING LAB	L	T	P	Cr.
		0	0	3	1.5

Pre-requisites: Engineering Chemistry lab

Course Educational Objectives: Thecourse aims to determine some important characteristics of water and wastewater in the laboratory and analyses the significance of the characteristics of the water and wastewater on the environment.

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

CO1: Determine few important characteristics of water and wastewater in the laboratory**(Apply-L3)**

CO2: Draw some conclusions based on prevailing standards about (i) suitability of water for a specific purpose (ii) options for the appropriate treatment options and ultimate disposal of sewage.**(Apply-L3)**

CO3: Interpret the impacts of the water or wastewater on the local environment **(Understand-L2)**

List of Experiments

1. Determination of pH and Electrical Conductivity (Salinity) of Water and Soil.
2. Determination and estimation of Total Hardness–Calcium & Magnesium.
3. Determination of Alkalinity/Acidity
4. Determination of Chlorides in water and soil
5. Determination and Estimation of Total Solids, Organic Solids and Inorganic Solids and Settleable Solids by Imhoff Cone.
6. Determination of Iron.
7. Determination of Dissolved Oxygen with D.O. Meter &Wrinklers Method and B.O.D.
8. Determination of N, P, K values in solid waste
9. Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.
10. Determination of C.O.D.
11. Determination of Optimum coagulant dose.
12. Determination of Chlorine demand.
13. Presumptive Coliform test.
14. Visit a Water Treatment Plant and give a technical report.

NOTE: At least 10 of the above experiments are to be conducted.

List of Equipment's

1) pH meter
2) Turbidity meter
3) Conductivity meter
4) Hot air oven
5) Muffle furnace
6) Dissolved Oxygen meter

7) U–V visible spectrophotometer
8) COD Reflux Apparatus
9) Jar Test Apparatus
10) BOD incubator
11) Autoclave
12) Laminar flow chamber
13) Hazen's Apparatus

Textbooks

1. Standard Methods for Analysis of Water and Waste Water – APHA
2. Chemical Analysis of Water and Soil by KVSG Murali Krishna, Reem Publications, New Delhi

Reference

1. Relevant IS Codes.
2. Chemistry for Environmental Engineering by Sawyer and Mc. Carty

B.Tech. (VI Sem.)	23CE59-HIGHWAY ENGINEERING LAB	L	T	P	Cr.
		0	0	3	1.5

Pre-requisites: Fundamentals of Building Materials

Course Objectives: The students completing the course are expected to

The course aims to explore the properties of various materials used in highway construction and enables students to identify their grades of materials.

Course Outcomes: On completion of the course, the student should be able to:

CO1: Assess the properties of highway construction materials such as aggregates and bitumen. **(Apply- L-3)**

CO2: Determine the optimum binder content with Marshall stability value. **(Understand- L-2)**

CO3: Analyze the test results and evaluate their suitability for pavement design and construction. **(Apply- L-2)**

List of Experiments

I. ROAD AGGREGATES:

1. Aggregate Crushing value Test
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption Test
4. Attrition Test
5. Abrasion Test.
6. Shape tests

II. BITUMINOUS MATERIALS:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Stripping Test
6. Viscosity Test.

III. BITUMINOUS MIX:

1. Marshall Stability test.

IV. TRAFFIC SURVEYS:

1. Traffic volume study at mid blocks.
2. Traffic Volume Studies (Turning Movements) at intersection.
3. Spot speed studies.
4. Parking study.

V. DESIGN & DRAWING

1. Earthwork calculations for road works
2. Drawing of road cross sections
3. Rotary intersection design

LIST OF EQUIPMENT:

1. Apparatus for aggregate crushing test.
2. Aggregate Impact testing machine
3. Pycnometers
4. Los angles Abrasion test machine
5. Deval's Attrition test machine
6. Elongation and thickness gauges
7. Bitumen penetration test setup.
8. Bitumen Ductility test setup.
9. Ring and ball apparatus
10. Viscometer.
11. Marshal Mix design apparatus.
12. Enoscope for spot speed measurement.
13. Stop Watches

TEXTBOOKS:

1. 'Highway Material Testing Manual' by S.K. Khanna, C.E.G Justo and A.Veeraraghavan, Neam Chan Brothers New Chand Publications, New Delhi.

REFERENCE BOOKS:

1. IRC Codes of Practice
2. Asphalt Institute of America Manuals
3. Code of Practice of B.I.S.

B.Tech. (VI Sem.)	23CES4-CAD LAB	L	T	P	Cr.
		0	1	2	2

Pre-requisites: Reinforced concrete structures, Design of steel structures, Auto CAD

Course Educational Objective: To impart hands-on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

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

CO1: Apply structural analysis software to analyze and design the beams, 2D and 3D frames (Apply-L3)

CO2: Design the retaining walls and foundations using STAAD Pro (Apply-L3)

CO3: Draw the details of RCC and steel structural elements suing Auto CAD. (Apply-L3)

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 subjected to DL & LL
5. Analysis & Design of residential building subjected to all loads (DL, LL,WL,EQL)
6. Analysis & Design of Roof Trusses
7. Design and detailing of built up steel beam
8. Developing a design program for foundation using EXCEL Spread Sheet
9. Detailing of RCC beam and RCC slab
10. Detailing of Steel built up compression member

Note: Drafting of all the exercises is to be carried out using commercially available designing software's.

B.Tech. (VI Sem.) **23CES4- SOFT SKILLS**

L	T	P	Cr.
0	1	2	2

Course Objectives:

- To equip the students with the skills to effectively communicate in English
- To train the students in interview skills, group discussions and presentation skills
- To motivate the students to develop confidence
- To enhance the students' interpersonal skills
- To improve the students' writing skills

UNIT – I

Analytical Thinking & Listening Skills: Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.
Communication Skills: Verbal Communication; Non Verbal Communication (Body Language)

UNIT – II

Self-Management Skills: Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities
Etiquette: Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT – III

Standard Operation Methods : Basic Grammars, Tenses, Prepositions, Pronunciation, Letter Writing; Note Making, Note Taking, Minutes Preparation, Email & Letter Writing

UNIT-IV

Job-Oriented Skills: Group Discussion, Mock Group Discussions, Resume Preparation, Interview Skills, Mock Interviews

UNIT-V

Interpersonal relationships: Introduction, Importance, Types, Uses, Factors affecting interpersonal relationships, Accommodating different styles, Consequences of interpersonal relationships

Text books:

1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.

Reference books:

1. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand& Company Ltd., 2018.
2. Raman, Meenakshi& Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

E-resources:

https://swayam-plus.swayam2.ac.in/courses/course-details?id=P_CAMBR_01

B.Tech. (VI Sem.) **23MC04-TECHNICAL PAPER WRITING & IPR**

L	T	P	Cr.
2	0	0	-

Course Objective:
The course will explain the basic related to writing the technical reports and understanding the concepts related to formatting and structuring the report. This will help students to comprehend the concept of proofreading, proposals and practice

Unit I: Introduction: An introduction to writing technical reports, technical sentences formation, using transitions to join sentences, Using tenses for technical writing.
Planning and Structuring: Planning the report, identifying reader(s), Voice, Formatting and structuring the report, Sections of a technical report, Minutes of meeting writing.

Unit II: Drafting report and design issues: The use of drafts, Illustrations and graphics.
Final edits: Grammar, spelling, readability and writing in plain English: Writing in plain English, Jargon and final layout issues, Spelling, punctuation and Grammar, Padding, Paragraphs, Ambiguity.

Unit III: Proofreading and summaries: Proofreading, summaries, Activities on summaries. **Presenting final reports:** Printed presentation, Verbal presentation skills, Introduction to proposals and practice.

Unit IV: Using word processor: Adding a Table of Contents, Updating the Table of Contents, Deleting the Table of Contents, Adding an Index, Creating an Outline, Adding Comments, Tracking Changes, Viewing Changes, Additions, and Comments, Accepting and Rejecting Changes, Working with Footnotes and Endnotes, Inserting citations and Bibliography, Comparing Documents, Combining Documents, Mark documents final and make them read only., Password protect Microsoft Word documents., Using Macros,

Unit V: **Nature of Intellectual Property:** Patents, Designs, Trade and Copyright. Process of **Patenting and Development:** technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property

Text Books:

1. Kompal Bansal & Parshit Bansal, "Fundamentals of IPR for Beginner's", 1st Ed., BS Publications, 2016.
2. William S. Pfeiffer and Kaye A. Adkins, "Technical Communication: A Practical Approach", Pearson.
3. Ramappa,T., "Intellectual Property Rights Under WTO", 2nd Ed., S Chand, 2015.

Reference Books:

1. Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011.
2. Day R, how to Write and Publish a Scientific Paper, Cambridge University Press(2006)

E-resources:

1. https://www.udemy.com/course/reportwriting/
2. https://www.udemy.com/course/professional-business-english-and-technical-report-writing/
3. https://www.udemy.com/course/betterbusinesswriting/