

Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Civil Engineering Degree Programme

Semester - III (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
				L	T	P	SL	Total		SEE	CIA			EE	PA				
										Max Marks	Max Marks	Max Marks	Min Marks	Max Marks	Max Marks	Max Marks	Min Marks		
1	Strength of Material	PCC	3CE201PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Transportation Engineering	PCC	3CE202PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Building Planning and Design	PCC	3CE203PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
4	Multidisciplinary Minor - I	MDM	3__204MD__	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - I	OE	3__205OE__	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Strength of Material - Lab	PCC	3CE206PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Transportation Engineering - Lab	PCC	3CE207PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Computer Aided Planning and Design-Lab	PCC	3CE208PC1	0	0	2	0	2	1					25	25	50	25	50	
9	Entrepreneurship in Civil Engineering	EEM	3CE209EM1	2	0	0	2	4	2						50	50	25	50	
10	Constitutional Values and Fundamental Duties	VEC	3SH210VE1	2	0	0	2	4	2						50	50	25	50	
11	Field Project	FP	3CE400FP1	0	0	4	0	4	2					25	25	50	25	50	
12	Disaster Management and Preparedness	NC	3AL001NC1	2	0	0	0	2	-										
Total				19	0	10	17	46	22			450				300		750	

Notional Learning Hours : [Workload (teaching/guidance/practicum) 29x15 = 435 Hrs] + [Learner-engaged time 17x15 = 255 Hrs]

Optional Course for Double Minor / Honours Degree

13	Double Minor / Honours Course - I	DH	3__211DH__	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
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Jawaharlal Darda Institute of Engineering & Technology, Yavatmal (Autonomous Institute)
Curriculum Structure (Scheme) for Four Year Multidisciplinary B. Tech in Civil Engineering Degree Programme

Semester - IV (Second Year)

Sr. No.	Course Name	Course Category	Course Code	Course Plan per Week (Hrs.)					Credits	Theory Evaluation		Theory (Total)		Practical/Term Work Evaluation		Practical/Term Work Evaluation (Total)		Total Max Marks	Theory Exam Time (Hrs.)
										SE	CIA			EE	PA				
				L	T	P	SL	Total		Max Marks	Max Marks	Max Marks	Max Marks	Max Marks	Min Marks				
1	Surveying	PCC	4CE212PC1	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
2	Concrete Technology	PCC	4CE213PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
3	Fluid Mechanics	PCC	4CE214PC1	2	0	0	2	4	2	60	40	100	40					100	3 Hrs.
4	Multidisciplinary Minor - II	MDM	4__215MD__	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
5	Open Elective - II	OE	4__216OE__	3	0	0	3	6	3	60	40	100	40					100	3 Hrs.
6	Concrete Technology - Lab	PCC	4CE217PC1	0	0	2	0	2	1					25	25	50	25	50	
7	Fluid Mechanics - Lab	PCC	4CE218PC1	0	0	2	0	2	1					25	25	50	25	50	
8	Surveying and Geomatics-Lab	VSC	4CE219VS1	0	0	4	0	4	2						50	50	25	50	
9	Technical Writing	AEC	4SH220AE1	1	0	2	1	4	2						50	50	25	50	
10	Fundamentals of Book Keeping and Accounting	EEM	4SH221EM1	1	0	2	1	4	2						50	50	25	50	
11	Environmental Science	VEC	4CE222VE1	2	0	0	2	4	2	30	20	50	20					50	2 Hrs.
Total				16	0	12	16	44	22			500				250		750	

Notional Learning Hours: [Workload (teaching/guidance/practicum) 28x15 = 420 Hrs] + [Learner-engaged time 16x15 = 240 Hrs]

Optional Course for Double Minor / Honours Degree

12	Double Minor / Honours Course - II	DH	4__223DH__	4	0	0	4	8	4	60	40	100	40					100	3 Hrs.
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Exit Option (Level 5) for Undergraduate Diploma in Odd Semester of next Academic Year as approved by BOS

13	Fundamentals of Structural Design	EC	5CE224EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.
14	Quantity Survey and Estimation	EC	5CE225EC1	2	0	4	2	8	4	30	20	50	20	25	25	50	25	100	2 Hrs.

OR

15	Internship / Apprenticeship in Industry	EI	5CE226EI1	0	0	16	0	288	8					100	100	200	100	200	
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OR

[illegible]

Syllabus for Semester III & IV

Level: 5	Course Code: 3CE201PC1		Course Category: PCC		
Course Name	Strength of Materials				
Credits	03	Total L:T:P Hours	3:0:0 45 Hrs	Total SL Hours	45 Hrs
Total Credit Hours	90 Hrs				
SEE Marks	60	SEE Time	3 Hrs	CIA Marks	40
EE Marks	--	PA Marks	--	Total Marks	100

Course Description:

Subject Code 3CE201PC1 Strength of Materials is a compulsory Program core course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to develop the ability to analyze stresses, strains, and deformation in structural elements such as beams, shafts, and bars, enabling safe and effective structural design.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE201PC1.1	Analyze direct and shear stresses, strains, and stress-strain behaviour of materials to understand elastic behaviour and mechanical performance.	C-4
3CE201PC1.2	Generate shear force and bending moment diagrams for beams under various loads to evaluate internal forces for structural analysis.	C-6
3CE201PC1.3	Calculate bending stresses and section modulus for solid and hollow sections to determine moment of resistance and safe beam design.	C-5
3CE201PC1.4	Apply torsion theory for circular shafts and compute power transmission to analyze shaft performance under twisting loads effectively.	C-3
3CE201PC1.5	Determine principal stresses and maximum shear stress in compound bars to assess failure conditions under complex stress states.	C-3
3CE201PC1.6	Evaluate slopes and deflections in loaded beams using appropriate methods to ensure structural serviceability and deformation control.	C-5

Course Contents:

Unit 1	Introduction and Basic Concepts: Overview of Strength of Materials and its applications : Concept of direct and shear stresses and strains, elastic constants, stress-strain types and relationship, Stress-strain diagrams and their characteristics for mild steel, Generalized Hook's law, Mechanical properties of materials.	7 hrs
Unit 2	Basics of Beam Analysis: Types of beams, Shear force and bending moment diagrams (SFD & BMD) for different loading conditions, relation between shear forces, bending moment and loading intensity.	8 hrs
Unit 3	Bending Stress in Beams: Bending stress and its distribution across a cross-section, Moment of inertia and section modulus calculations, Simple bending theory, section modulus, moment of resistance, bending stresses in different section (solid and hollow)	7 hrs
Unit 4	Torsion of Circular Shafts Assumption for derivation of shaft and torsion equation, Torsion, angle of twists and power transmission of shaft.	8 hrs
Unit 5	Analysis of stress and strain Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, Principal stresses and maximum shear stress,	7 hrs
Unit 6	Study of deflection and slope in beam Determination of beam's deflection and slopes for beams subjected to different load conditions.	8 hrs

Text Books:

1. R. K. Bansal, Strength of Materials, Laxmi Publications.
2. S. Ramamrutham, Strength of Materials, Dhanpat Rai & Sons.
3. F. P. Beer, E. R. Johnston Jr., (and J. T. DeWolf), *Mechanics of Materials*, McGraw-Hill Education.

Reference Books:

1. S. K. Mondal, Strength of Materials, PHI Learning / Prentice Hall of India.
2. R. K. Rajput, Strength of Materials, S. Chand & Company.

E Recourses:

1. https://onlinecourses.nptel.ac.in/noc23_me140

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE201PC1.1	3	2	-	-	-	-	-	-	-	-	-	1	-	-
3CE201PC1.2	3	3	-	2	-	-	-	-	-	-	-	-	3	-
3CE201PC1.3	3	3	-	-	-	-	-	-	-	-	-	-	3	1
3CE201PC1.4	3	2	-	-	-	-	-	-	-	-	-	-	2	-
3CE201PC1.5	3	2	-	2	-	-	-	-	-	-	-	-	2	-
3CE201PC1.6	3	2	-	2	-	-	-	-	-	-	-	-	2	1
3CE201PC1.CO	3	2	-	1	-	-	-	-	-	-	-	1	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: 5	Course Code: 3CE202PC1		Course Category: PCC		
Course Name	Transportation Engineering				
Credits	02	Total L:T:P Hours	2:0:0	Total SL Hours	30 Hrs
Total Credit Hours	60 Hrs		30 Hrs		
SEE Marks	60	SEE Time	3 Hrs	CIA Marks	40
EE Marks	--	PA Marks	--	Total Marks	100

Course Description:

Subject Code 3CE202PC1 Transportation Engineering is a compulsory Program core course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to provide knowledge of transportation systems, highway and pavement design, railway, airport, waterway, and bridge engineering for efficient infrastructure planning and development.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE202PC1.1	Explain various transport modes, scope and economic role of transportation systems to understand system-level planning of infrastructure.	C-2
3CE202PC1.2	Design highway alignment and geometric elements including cross-section, gradient and sight distances to enable safe and efficient road infrastructure layout.	C-6
3CE202PC1.3	Evaluate pavement components, materials and design methodologies (flexible/rigid) to develop long-lasting pavement structures	C-5
3CE202PC1.4	Analyse railway track components, alignment and station/yard planning to ensure operational reliability and safety in rail infrastructure.	C-4
3CE202PC1.5	Assess airport and waterway infrastructure components including runways, docks and navigation aids to cater for capacity, demand and multimodal logistics requirements.	C-5
3CE202PC1.6	Justify bridge structural parameters including scour, afflux, foundations, and classify structural types to facilitate safe bridge design	C-5

Course Contents:

Unit 1	Introduction to Transportation Systems Definition, scope, and importance of transportation engineering, Types of transportation modes: Road, Rail, Air and Water, Transportation and its role in economic development.	4 hrs
Unit 2	Highway Engineering Principles of highway planning and alignment, Geometric design of highways: cross-section, gradient, sight distances, Materials and construction methods for pavements.	5 hrs
Unit 3	Pavement Design Components of pavements, Pavement Types and Materials: Flexible and rigid pavements, Materials used in pavement construction (bitumen, cement concrete, aggregates), Pavement design considerations (subgrade, traffic load, climatic conditions). Pavement Design Methods: IRC, Structural design of flexible and rigid pavements.	6 hrs
Unit 4	Railway Engineering Fundamentals of railway track components: rails, sleepers, ballast, and fastenings, Track geometry and alignment, stations and yard planning.	5 hrs
Unit 5	Airport and Waterway Engineering Components of an airport: Runways, taxiways, terminals, and aprons, Airport layout and air traffic control systems, Airport capacity and demand forecasting, Basics of ports, harbours, and shipping logistics,	5 hrs
Unit 6	Bridge Engineering Bridge Engineering-Components, classification and identification, data collection, site selection, economic span, Estimation of flood discharge, water way, scour depth, depth of foundation, Afflux, clearance and free board,	5 hrs

Text Books:

1. K. K. Khanna & C. E. G. Justo, Highway Engineering, Nem Chand & Bros.
2. S. P. Chandola, A Textbook of Transportation Engineering, S Chand & Co.

Reference Books:

1. Handbook of Transportation Engineering, Publisher: McGraw-Hill
2. L. R. Kadiyali, Transportation Engineering, Publisher: Khanna Publishers.

E Recourses:

1. https://books.google.co.in/books/about/A_Textbook_of_Transportation_Engineering.

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE202PC1.1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
3CE202PC1.2	3	3	3	-	-	-	-	-	-	-	-	1	3	2
3CE202PC1.3	3	3	3	-	-	2	2	-	-	-	-	1	3	2
3CE202PC1.4	3	2	-	-	-	-	2	-	-	-	-	1	1	2
3CE202PC1.5	3	2	-	-	-	-	2	-	-	-	-	-	1	1
3CE202PC1.6	3	2	-	-	-	-	2	-	-	-	-	1	3	2
3CE202PC1.CO	3	2	1	-	-	1	2	-	-	-	-	1	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: 5	Course Code: 3CE203PC1		Course Category: PCC		
Course Name	Building Planning and Design				
Credits	03	Total L:T:P Hours	3:0:0	Total SL Hours	45 Hrs
Total Credit Hours	90 Hrs		45 Hrs		
SEE Marks	60	SEE Time	3 Hrs	CIA Marks	40
EE Marks	--	PA Marks	--	Total Marks	100

Course Description:

Subject Code 3CE203PC1 Building Planning and Design is a compulsory Program core course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to familiarize students with principles of planning, building regulations, structural systems, services, and drafting tools for designing functional, safe, and code-compliant buildings.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE203PC1.1	Explain planning principles and architectural elements like balance, proportion, scale, and aesthetics to create functional and appealing buildings.	C2
3CE203PC1.2	Classify building types and structural systems including load-bearing, framed, composite structures to select suitable construction approaches effectively.	C4
3CE203PC1.3	Apply NBC guidelines, zoning laws, FSI, setbacks, and fire safety requirements to ensure buildings comply with essential regulations effectively.	C3
3CE203PC1.4	Develop layouts for residential and public buildings using functional space standards to prepare efficient architectural plans meeting user needs.	C6
3CE203PC1.5	Illustrate plumbing, ventilation, lighting, electrical and HVAC basics with fire planning to integrate essential building services ensuring occupant safety.	C3
3CE203PC1.6	Demonstrate manual and digital drafting using AutoCAD and Revit with conceptual design to produce professional architectural building drawings effectively.	C3

Course Contents:

Unit 1	Introduction to Building Planning: Principles of Planning: Aspect, Prospect, Orientation, Circulation, Privacy, Architectural Principles: Balance, Proportion, Scale, Aesthetics.	7 hrs
Unit 2	Building Components and Structural Overview: Classification of Buildings: Residential, Commercial, Institutional, Industrial, Functional Requirements of Buildings, Overview of Structural Systems: Load-Bearing, Framed, Composite Structures.	8 hrs
Unit 3	Building Bye-Laws and Regulation: Introduction to National Building Code: NBC, Zoning Laws, Floor Space Index (FSI), Setbacks, Basics of Fire Safety Regulations.	7 hrs
Unit 4	Planning of Residential and Public Buildings: Residential Buildings: Apartments, Bungalows, Row Houses, Functional Space Requirements and Room Layout Design, Layout, Public Buildings: Schools, Hospitals, Offices, Auditoriums, Preparation of Residential & Commercial Building Plans.	8 hrs
Unit 5	Building Services and Safety Considerations: Plumbing Applications: Water Supply and Drainage Systems, Ventilation and Natural Lighting, Introduction to Electrical & HVAC Systems. Fire Safety Planning.	7 hrs
Unit 6	Design and Drafting of Buildings: Introduction to AutoCAD and Revit for Building Design, Basics of Manual and Digital Building Drawings, Overview of Conceptual Design and Presentation of Architectural Plans.	8 hrs

Text Books:

1. Shah, Kale & Patki, Building Drawing, Tata McGraw-Hill
2. Bindra & Arora, Building Construction, Dhanpat Rai Publications

Reference Books:

1. National Building Code of India, BIS Publications
2. Chudley R. & Greeno R., Building Construction Handbook, Pearson

E Recourses:

1. <https://learn.autodesk.com>

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE203PC1.1	3	2	-	-	-	-	-	-	-	-	-	-	2	-
3CE203PC1.2	3	2	-	-	-	-	-	-	-	-	-	-	2	2
3CE203PC1.3	3	2	-	-	-	-	-	-	-	-	-	-	2	2
3CE203PC1.4	3	2	2	-	-	-	-	-	-	-	-	-	3	-
3CE203PC1.5	3	2	-	-	-	-	-	-	-	-	-	-	2	3
3CE203PC1.6	3	2	-	-	-	-	-	-	-	-	-	-	3	2
3CE203PC1.CO	3	2	1	-	-	-	-	-	-	-	-	-	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: 5	Course Code: 3CE204MD1		Course Category: MDM		
Course Name	Basic Civil Engineering				
Credits	02	Total L:T:P Hours	2:0:0	Total SL Hours	30 Hrs
Total Credit Hours	60 Hrs		30 Hrs		
SEE Marks	30	SEE Time	2 Hrs	CIA Marks	20
EE Marks	--	PA Marks	--	Total Marks	50

Course Description:

Subject Code 3CE204MD1 Basic Civil Engineering is a Multidisciplinary Minor course for Second Year B. Tech Textile/Mechanical/Electrical/Computer Science/EXTC/Chemical Engineering.

Course Objectives:

The objective of this course is to provide students with a insights in the field of Civil Engineering, its history, significance, basic concepts, and the various branches and applications of the discipline.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE204MD1.1	Explain evolution, scope and interdisciplinary domains of civil engineering to understand its contribution in national infrastructure development and society.	C-2
3CE204MD1.2	Classify structural components and construction materials including foundation, beams, slabs and bricks to evaluate suitability for building applications.	C-4
3CE204MD1.3	Apply surveying principles using conventional and modern instruments including total station and GPS to measure distances, angles and elevations accurately.	C-3

Course Contents:

Unit 1	Introduction to Civil Engineering: Overview of Civil Engineering, History and Evolution of Civil Engineering, Definition and Scope, Role & importance of Civil Engineers in nation-building and infrastructure development, various disciplines of Civil Engineering, Introduction to types of buildings as per NBC.	10 hrs
Unit 2	Elements of Building and Materials: Basic Principles of Structures, Types of Structures, Introduction to Materials; Components in building- Need, function and types of	10 hrs

	foundation, beams, columns, slabs, walls and roofs, Construction Materials- uses and properties of bricks, sand cement, aggregates and steel.	
Unit 3	Basics of Surveying and Measurement: Fundamentals of Surveying: Principles, Importance, Applications, Types of Surveys: Chain, Compass, Plane Table, Theodolite, Total Station, Basic Measurement Techniques: Linear, Angular, Levelling, Modern Surveying Techniques: GIS, GPS, Drones, Remote Sensing.	10 hrs

Text Books:

1. S. S. Bhavikatti, Basic Civil Engineering, New Age International Publishers
2. B. C. Punmia, Ashok Kumar Jain & Arun Jain, Surveying (Vol. I & II), Laxmi Publications
3. B. C. Punmia, Building Construction, Laxmi Publications
4. S. K. Duggal, Building Materials, New Age International Publishers

Reference Books:

1. S. V. Deodhar, Civil Engineering Materials & Construction, Nirali Prakashan
2. P. C. Varghese, Building Construction, Prentice Hall India

E Recourses:

1. <https://www.bis.gov.in/?lang=hi>

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE204MD1.1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
3CE204MD1.2	3	2	-	-	-	-	-	-	-	-	-	-	2	2
3CE204MD1.3	3	2	-	-	-	-	-	-	-	-	-	3	2	1
3CE204MD1.CO	3	2	-	-	-	-	-	-	-	-	-	-	-	-

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	3SH205OE1	Course Category:	OE
Course Name	Soft Skills & Profile Building				
Credits	03	Total	3:0:0	Total SL	45 Hrs
Total Credit Hours	90 Hrs	L:T:P Hours	45 Hrs	Hours	
SEE Marks	60	SEE Time	3 Hrs	CIA Marks	40
EE Marks	--	PA Marks	--	Total Marks	100

Course Description:

Subject Code 3SH205OE1 Soft Skills & Profile Building is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The objective of this course is to focus on developing advanced communication skills, leadership qualities and professional etiquette among engineering graduates.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE1.1	Apply advanced interpersonal, analytical, and persuasive communication techniques in professional contexts for effective professional interactions.	C-3
3SH205OE1.2	Demonstrate professional workplace etiquette, business communication, and group discussion skills to enhance employability.	C-3 A-3
3SH205OE1.3	Analyze leadership styles, emotional intelligence, and team dynamics for effective collaboration.	C-4 A-3
3SH205OE1.4	Design a structured and realistic career plan aligned with industry expectations and personal goals for professional growth.	C-6
3SH205OE1.5	Create ATS-friendly résumés, professional portfolios, and digital profiles for personal branding.	C-6 P-4
3SH205OE1.6	Perform effectively in interviews, workplace simulations, and job-search processes with professional confidence for enhanced employability.	C-3 P-3 A-3

Course Contents:

Unit 1	Advanced Communication Dynamics: Advanced interpersonal communication strategies; speech articulation; structuring thoughts and fluency techniques; analytical and critical communication; storytelling techniques for impactful presentations; persuasive communication models.	7 Hrs
Unit 2	Global Workplace Etiquettes, Email Writing & GD-PI Perspective: Professional greetings and workplace conduct; giving and receiving feedback; handling criticism and adaptability issues; professional values such as punctuality and attire; types of handshakes and significance; effective business email writing; types of Group Discussions, purpose of GDs; mock GDs (video-based); interview strategies and techniques.	8 Hrs
Unit 3	Leadership, Team Dynamics & Corporate Skills: Personality types using 9/9 matrix; leadership styles; emotional intelligence and leadership relationship; conflict resolution and negotiation techniques; team-building skills (Johari Window perspective); cross-cultural communication; creativity and design thinking; structured problem-solving and decision-making.	7 Hrs
Unit 4	Strategizing Career Planning: SMART goal setting; mapping skills to career paths; understanding industry expectations; emerging futuristic soft and hard skills (domain-wise); personalized career roadmap; certification planning (technical and non-technical); networking skills and participation in professional communities	7 Hrs
Unit 5	Profile Building, Portfolio & Personal Branding: ATS-friendly résumé preparation and common mistakes; video résumé creation and self-marketing pitch; LinkedIn profile optimization and networking strategies; developing online portfolios using platforms such as GitHub, Behance, Google Sites, and Toastmasters	8 Hrs
Unit 6	Employment Readiness & Industry Integration: Workplace simulation activities (mock emails, meetings, discussions); mock personal interviews; understanding sector-specific industry dynamics; unconventional career opportunities after engineering; job-hunting strategies and popular job platforms	8 Hrs

Text Books:

1. Alex K., Soft Skills, S. Chand Publishing
2. Meenakshi Raman & Prakash Singh, Business Communication, Oxford University Press

Reference Books:

1. Stephen R. Covey, The 7 Habits of Highly Effective People, Free Press Publication
2. Daniel Goleman, Emotional Intelligence, published by Bantam Books.
3. Shiv Khera, You Can Win, published by Bloomsbury Publishing
4. Richard N. Bolles, What Color Is Your Parachute? Published by Ten Speed Press, Crown Publishing Group

E Resources:

1. NPTEL: Soft Skills and Personality Development
2. LinkedIn Learning – Communication & Career Development Courses
3. Harvard Business Review – Communication & Leadership Articles
4. Coursera /edX – Career Development & Employability Skills Modules

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH205OE1.1	2	3	2	–	–	–	–	2	3	–	–	1	2	1
3SH205OE1.2	–	2	–	–	–	2	3	3	3	–	–	1	2	2
3SH205OE1.3	–	3	2	–	–	2	2	3	–	–	–	1	2	2
3SH205OE1.4	–	3	3	–	–	2	–	–	–	2	3	–	3	–
3SH205OE1.5	–	2	3	–	3	–	–	–	2	–	2	–	3	1
3SH205OE1.6	–	2	2	–	2	2	–	2	3	–	2	1	2	2
3SH205OE1CO	1	3	2	–	1	2	1	2	2	1	1	1	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	3SH205OE2	Course Category:	OE
Course Name	Team Building & Management				
Credits	03	Total	3:0:0	Total SL	45 Hrs
Total Credit Hours	90 Hrs	L:T:P Hours	45 Hrs	Hours	
SEE Marks	60	SEE Time	3 Hrs	CIA Marks	40
EE Marks	--	PA Marks	--	Total Marks	100

Course Description:

Subject Code 3SH205OE2 Team Building & Management is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The Objective of the course is to develop teamwork capabilities, leadership and managerial skills, collaborative problem-solving abilities, conflict management techniques, and effective decision-making skills required in professional and organizational settings.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH205OE2.1	Explain the principles and importance of effective team building in organizations to foster collaborative work culture.	C-2
3SH205OE2.2	Apply team dynamics and collaboration strategies to achieve common goals.	C-3 A-3
3SH205OE2.3	Analyze leadership styles and managerial roles for effective team performance.	C-4
3SH205OE2.4	Demonstrate conflict resolution, negotiation, and interpersonal management skills for effective team performance.	C-3 A-3
3SH205OE2.5	Apply motivation and performance management techniques in team-based environments for achieving organizational goals.	C-3
3SH205OE2.6	Perform effectively as a team member or leader in simulated managerial scenarios to develop leadership competencies	C-3 P-3 A-3

Course Contents:

Unit 1	Fundamentals of Team Building: Concept of teams; types of teams; stages of team development; characteristics of effective teams; roles and responsibilities of team members; barriers to effective teamwork; team norms and values.	7Hrs
Unit 2	Team Dynamics & Interpersonal Relationships: Group behavior and dynamics; interpersonal communication in teams; trust and collaboration; listening as a team skill; diversity and inclusion in teams; cross-cultural team management	8Hrs
Unit 3	Leadership in Teams: Leadership concepts; leadership styles; emotional intelligence and leadership; situational leadership; influence and power in teams; leadership ethics and responsibilities.	7 Hrs
Unit 4	Conflict Management & Negotiation: Sources and types of conflict; conflict resolution techniques; negotiation strategies; managing difficult team members; stress management; maintaining team harmony	7 Hrs
Unit 5	Motivation, Performance & Team Effectiveness: Motivation theories; team motivation techniques; goal setting and performance measurement; feedback and appraisal systems; decision-making in teams; problem-solving techniques.	8 Hrs
Unit 6	Managerial Skills & Team-Based Applications: Managerial roles and functions; planning, organizing, and controlling teams; delegation and coordination; workplace simulations (team meetings, role plays); case studies on team management; team performance evaluation.	8 Hrs

Text Books:

1. Stephen P. Robbins, Organizational Behavior, Pearson Education
2. L.M. Prasad, Management Principles and Practices, published by Sultan Chand & Sons

Reference Books:

1. Patrick Lencioni, The Five Dysfunctions of a Team, published by Jossey-Bass
2. Peter G. Northouse, Leadership, published by SAGE Publications
3. Daniel Goleman, Emotional Intelligence, published by Bantam Books

E Resources:

1. NPTEL – Organizational Behaviour & Management Courses
2. LinkedIn Learning – Team Leadership & Management Modules
3. Harvard Business Review – Teamwork & Leadership Articles
4. Coursera / edX – Team Management and Leadership Courses

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH205OE2.1	2	–	–	–	–	–	–	–	–	–	–	1	2	2
3SH205OE2.2	–	2	2	–	–	–	–	3	2	–	–	1	2	3
3SH205OE2.3	–	3	3	–	–	–	–	2	–	–	–	–	2	3
3SH205OE2.4	–	2	2	–	–	2	3	3	–	–	–	–	2	3
3SH205OE2.5	–	2	2	–	–	–	–	2	–	2	–	–	2	3
3SH205OE2.6	–	2	2	–	–	2	–	3	2	–	2	1	2	3
3SH205OE2 CO	1	2	2	–	–	1	1	2	1	1	1	1	2	3

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: 5	Course Code: 3CE206PC1		Course Category: PCC		
Course Name	Strength of Materials Lab				
Credits	01	Total L:T:P Hours	0:0:2 30 Hrs	Total SL Hours	--
Total Credit Hours	30 Hrs				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	25	PA Marks	25	Total Marks	50

Course Description:

Subject Code 3CE206PC1 Strength of Materials Lab is a compulsory Laboratory Program Core Course for Second Year B. Tech. Civil Engineering.

Course Objectives:

The objective of this course is to provide hands-on experience on the mechanical properties of materials through tension, compression, shear, impact, hardness, torsion tests, and structural analysis of beams, springs, and columns.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE206PC1.1	Perform tensile, compression, shear, impact, and hardness tests on engineering materials to evaluate mechanical behaviour and material performance accurately	C-5 & P-4
3CE206PC1.2	Proficiently perform experimental test on UTM, CTM, Izod, and Charpy setups to measure strength parameters and compare material properties scientifically.	C-5& P-4
3CE206PC1.3	Demonstrate testing skills including torque and deflection measurement using laboratory instruments to develop hands-on competency and practice professional laboratory.	C-5, P-5 & A-5

List of Practicals:

Minimum Eight of mentioned below:

1. Determination of Tensile Strength of Steel Bar using Universal Testing Machine (UTM).
(As per IS 1608 – Tensile Testing of Metals)
2. Determination of Compressive Strength of Burnt Clay Building Bricks using CTM/UTM.
(As per IS 3495 (Part 1))
3. Determination of Compressive Strength of Timber Specimen
(As per IS 1708 (Part 7))

4. Determination of Shear Strength of Mild Steel Bar
(General mechanical testing procedure)
5. Determination of Impact Strength of Metal by Izod Impact Test.
(As per IS 1598)
6. Determination of Impact Strength of Metal by Charpy Impact Test.
(As per IS 1757)
7. Determination of Hardness of Metal Specimen (Brinell/Rockwell/Vickers Method). (As per IS 1500 / IS 1586 / IS 1501)
8. Determination of Torsional Strength of Metal Specimen using Torsion Testing Machine.
9. Determination of Deflection of Beam under Loading using Universal Testing Machine (UTM).

E Recourses:

1. <https://sm-nitk.vlabs.ac.in/>

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE206PC1.1	3	-	-	2	3	-	-	-	-	-	-	3	-	2
3CE206PC1.2	3	2	-	3	3	-	-	-	-	-	-	3	-	2
3CE206PC1.3	3	-	-	3	3	-	2	-	1	-	-	3	-	2
3CE206PC1.CO	3	1	1	3	3	-	1	-	1	-	-	3	-	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: 5	Course Code: 3CE207PC1		Course Category: PCC		
Course Name	Transportation Engineering - Lab				
Credits	01	Total L:T:P Hours	0:0:2	Total SL Hours	--
Total Credit Hours	30 Hrs		30 Hrs		
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	25	PA Marks	25	Total Marks	50

Course Description:

Subject Code 3CE207PC1 Transportation Engineering Lab is a compulsory Laboratory Program Core Course for Second Year B. Tech. Civil Engineering.

Course Objectives:

The objective of this course is to provide hands-on experience in material testing, pavement evaluation, traffic studies, and total station surveying for effective transportation engineering and infrastructure planning.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE207PC1.1	Perform pavement material tests including abrasion, impact, crushing, softening point and marshal stability to evaluate suitability for road construction.	C-5 & P-5
3CE207PC1.2	Analyze pavement performance by performing Benkelman beam testing, traffic volume study and pavement condition rating to assess structural and service conditions.	C-4 & P-5
3CE207PC1.3	Execute field surveys using total station and origin-destination methods to plan road alignment and transportation improvements effectively participating in teams or individual.	C-2, P-5 & A-2

List of Practicals:

Minimum Eight of mentioned below:

1. Determination of Abrasion Value of Aggregates using Deval's Machine.
(As per IS 2386 (Part 4))
2. Determination of Aggregate Impact Value (AIV).
(As per IS 2386 (Part 4))
3. Determination of Flakiness Index and Elongation Index of Aggregates.
(As per IS 2386 (Part 1))
4. Benkelman Beam Test for Measurement of Deflection of Flexible Pavements.
(As per IRC: 81)

5. Determination of Softening Point of Bituminous Material (Ring and Ball Method).
(As per IS 1205)
6. Determination of Aggregate Crushing Value (ACV)
(As per IS 2386 (Part 4))
7. Traffic Volume Study using Manual or Automatic Traffic Counters
(As per IRC: 9)
8. Determination of Marshall Stability and Flow Value of Bituminous Mix.
(As per ASTM D1559 / IRC: 111)
9. Pavement Condition Survey and Pavement Rating
(As per IRC: 82)
10. Origin-Destination (O-D) Survey and Transportation Planning Study. (As per IRC: 102)
11. Survey of Road Alignment using Total Station
(As per IS 12858)
12. Field Visit to Railway Station and Study of Railway Infrastructure Components.

E Recourses:

1. <https://ts-nitk.vlabs.ac.in/>

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE207PC1.1	3	2	-	2	3	-	-	-	-	-	-	3	1	2
3CE207PC1.2	3	2	-	3	3	-	-	-	-	-	-	2	2	2
3CE207PC1.3	2	2	-	3	3	-	2	3	2	-	-	3	2	1
3CE207PC1.CO	3	2	-	2	2	-	1	1	1	-	-	3	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: 5	Course Code: 3CE208PC1		Course Category: PCC		
Course Name	Computer Aided Planning and Design-Lab				
Credits	01	Total L:T:P Hours	0:0:2	Total SL Hours	--
Total Credit Hours	30 Hrs		30 Hrs		
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	25	PA Marks	25	Total Marks	50

Course Description:

Subject Code 3CE208PC1 Computer Aided Planning and Design Lab is a compulsory Vocational Science Course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to develop skills in drafting building elements, interpreting drawings, creating residential and public building plans, operating CAD software, and designing multi-storeyed buildings, adhering to standards and regulatory requirements.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE208PC1.1	Apply building planning principles, zoning regulations, FSI calculations, and functional space standards to prepare accurate residential and public building layouts effectively.	C-3 & P-2
3CE208PC1.2	Develop CAD/Revit drawings including floor plans, elevations, sections, service layouts, lighting, ventilation, and fire safety elements to produce professional-quality architectural drawings.	C-6 & P-7
3CE208PC1.3	Appreciate the importance of safety, sustainability, circulation efficiency, and service integration by analyzing building orientations, sun-path, fire routes, and preparing site-planning checklists.	C-3, P-2 & A-3

List of Practicals:

Minimum Eight of mentioned below:

1. Creating a basic floor plan, elevation, and section using CAD or Revit tools.
2. Drawing water supply and drainage layout for a small residential unit.
3. Drawing of a 2-BHK or 3-BHK plan with proper dimensions and circulation.
4. Preparing a complete residential or commercial site layout including pathways, parking, services, and open spaces.

5. Identification of fire escape routes, staircases, and fire-safe design elements from sample plans.
6. Preparation of a checklist for residential, commercial, institutional, and industrial buildings.
7. Preparing natural lighting, ventilation, and basic electrical points layout.
8. Solving problems based on zoning laws and FSI as per local bye-laws or NBC guidelines.
9. Case Study on Sun-path analysis and ventilation mapping for different building orientations.
10. Preparing layout of a school/hospital/office based on functional space standards.
11. Study and interpretation of fire safety symbols and their placement in building plans.
12. Preparation of water supply and drainage line diagrams for a small residential building

E Recourses:

1. <https://www.nfpa.org>
2. <https://learn.autodesk.com>

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE208PC1.1	3	2	2	-	3	-	-	-	-	-	-	-	3	-
3CE208PC1.2	3	2	3	-	3	-	-	-	-	-	-	-	3	2
3CE208PC1.3	3	2	2	-	3	-	-	2	1	-	-	-	2	2
3CE208PC1.CO	3	2	3	-	3	-	-	1	1	-	-	-	3	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: 5	Course Code: 3CE209EM1		Course Category: EEM		
Course Name	Entrepreneurship in Civil Engineering				
Credits	02	Total L:T:P Hours	2:0:0	Total SL Hours	30 Hrs
Total Credit Hours	60 Hrs		30 Hrs		
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	50	Total Marks	50

Course Description:

Subject Code 3CE202PC1 Entrepreneurship in Civil Engineering an Entrepreneurship/Economics Management Course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to develop an ability to identify and convert civil engineering problems into business opportunities.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE209EM1.1	Explain entrepreneurship concepts, characteristics, and relevance in civil engineering to understand its role in national infrastructure development.	C-2
3CE209EM1.2	Apply idea generation techniques such as mind-mapping and SCAMPER to identify business opportunities in construction domains effectively.	C-3
3CE209EM1.3	Create start-up establishment plans including legal registrations and tendering basics to prepare executable business plans for civil enterprises.	C-6

Course Contents:

Unit 1	Fundamentals of Entrepreneurship in Civil Engineering Definition and characteristics of entrepreneurs, Types of entrepreneurship, Relevance of entrepreneurship in civil engineering, Role of entrepreneurship in national infrastructure development, Entrepreneurship ecosystem in India, Overview of Startup India, MSME sector, government support schemes, financial assistance and incubation centres, Differences between employment, freelancing, and entrepreneurship.	10 Hrs
Unit 2	Idea Generation & Business Model Development: Problem identification in construction projects, Brainstorming	10 hrs

	tools and Ideation methods (mind-mapping, SCAMPER), Opportunity mapping in construction, consultancy, material supply, and project management. Business Model Canvas – value proposition, customer segments, channels, key partners, resources, cost & revenue structure.	
Unit 3	Business Planning & Startup Establishment: Steps to start a civil-based enterprise: Proprietorship, Partnership, LLP, Pvt. Ltd., registration basics (GST, PAN, UDYAM/MSME), Contractor Licensee Registration, Overview of tenders and E-Tendering Process, bidding procedures, local business rules. Validating business ideas through market surveys, customer feedback, competitive analysis, Pricing strategies, basics of estimating cost, working capital, profit and break-even concepts.	10 Hrs

Text Books:

1. Dr. S. S. Khanka, Entrepreneurial Development, S. Chand Publishing.
2. Vasant Desai, Dynamics of Entrepreneurship Development, Himalaya Publishing House.
3. Niraj Kumar, Entrepreneurship Development and Management, Himalaya Publishing House.

Reference Books:

1. Peter F. Drucker, Innovation and Entrepreneurship, Harper Business.
2. S. K. Sahu, Entrepreneurship in Economic Development, RBSA Publishers.

E Recourses:

1. <https://www.startupindia.gov.in/learning-program>
2. <https://cii.in>

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE209EM1.1	3	2	-	-	-	-	-	-	-	-	-	-	-	-
3CE209EM1.2	3	2	-	-	-	2	-	-	-	2	-	-	1	-
3CE209EM1.3	3	2	-	-	-	2	-	-	-	-	-	-	2	2
33CE209EM1.CO	3	2	1	1	-	1	-	-	-	1	-	-	1	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: 5	Course Code: 3SH210VE1		Course Category:	VEC	
Course Name	Constitutional Values and Fundamental Duties				
Credits	02	Total	2:0:0	Total SL Hours	30
Total Credit Hours	60 Hrs	L:T:P Hours	30 Hrs		Hrs
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks		PA Marks	50	Total Marks	50

Course Description:

Subject Code 3SH210VE1 Constitutional Values and Fundamental Duties is a compulsory Values enhancement Course for Second Year B. Tech.

Course Objectives:

The objective of the course is to introduce the Indian Constitution, its historical background, fundamental values, rights, and duties.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3SH210VE1.1	Explain the historical background, making, and significance of the Indian Constitution to Understand the Constitution, Preamble, and core values.	C2
3SH210VE1.2	Interpret Fundamental Rights and Duties (Articles 12–35, 51A) to evaluate their implications through case studies in professional and civic life.	C3
3SH210VE1.3	Apply constitutional principles to engineering ethics, sustainability concerns (Articles 48A, 51A(g)), and demonstrate social commitment, innovation, and inclusive growth as nation builders.	C3

Course Contents:

Unit 1	Introduction to the Constitution and Fundamental Values: Overview of the Indian Constitution – Historical background and making of the Constitution; Meaning of Constitution; Preamble – Meaning and significance. Core Constitutional Values – Justice (Social, Economic, Political); Liberty (thought, expression, belief, faith, worship); Equality (status and opportunity); Fraternity (dignity and unity of the nation). Relevance of constitutional values for professionals and citizens.	10 Hrs
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Unit 2	Fundamental Rights and Duties: Fundamental Rights (Articles 12–35) – Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies. Fundamental Duties (Article 51-A) – Importance and implications; Role of youth and professionals in upholding duties. Case studies highlighting real-life significance of rights and duties.	10 Hrs
Unit 3	Application of Constitutional Values in Engineering and Public Life: Ethical Responsibilities and Constitutional Alignment – Engineering ethics and public interest; Environment and sustainability as constitutional concern (Articles 48A, 51A(g)); Engineers as nation builders – Social commitment, innovation, and inclusive growth.	10 Hrs

Text Books:

1. Basu D. D., Introduction to the Constitution of India, LexisNexis Publication, New Delhi (Twenty-Third Edition).
2. Jain M. P., Constitution of India, LexisNexis Publication, New Delhi (Eighth Edition).
3. Laxmikanth M., Indian Polity, McGraw Hill Education, New Delhi (Sixth Edition).
4. Austin Granville, The Indian Constitution: Cornerstone of a Nation, Oxford University Press, New Delhi.
5. Shukla V. N., Constitution of India, Eastern Book Company, Lucknow (Twelfth Edition).
6. Government of India, Constitution of India (Bare Act), Government of India Publication, New Delhi.

Reference Books:

1. Subhash Kashyap, Our Constitution, National Book Trust, New Delhi.
2. Durga Das Basu, Shorter Constitution of India, LexisNexis Publication.
3. P. M. Bakshi, The Constitution of India, Universal Law Publishing.
4. J. N. Pandey, Constitutional Law of India, Central Law Agency.
5. Seervai H. M., Constitutional Law of India, N. M. Tripathi Pvt. Ltd. (Vols. I–III).
6. B. Shiva Rao, The Framing of India's Constitution: A Study, Indian Institute of Public Administration.
7. D. C. Wadhwa, Political Science and Constitutional Law, Eastern Book Company.
8. Madhav Khosla, The Indian Constitution: Oxford India Short Introductions, Oxford University Press.

E Resources:

1. NPTEL course on Constitutional Studies, Prof. Sudhir Krishnaswamy, National Law School of India University
2. Constitutional Values and Fundamental Duties (University of Delhi – aligned with NEP 2020, available via NPTEL/DU open learning)

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3SH210VE1.1	3	2	-	1	-	-	-	-	-	-	-	1	2	1
3SH210VE1.2	-	3	2	2	-	2	3	3	-	-	-	1	2	1
3SH210VE1.3	-	-	3	3	-	2	3	2	-	2	-	1	2	2
3SH210VE1CO	1	2	2	2	-	2	2	2	-	1	-	1	2	2

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	3CE400FP1	Course Category:	FP
Course Name	Field Project				
Credits	02	Total L:T:P Hours	0:0:4 60 Hrs	Total SL Hours	--
Total Credit Hours	60 Hrs				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	25	PA Marks	25	Total Marks	50

Course Description:

Subject Code 3CE400FP1 Field Project is a compulsory Experiential Learning Course for Second Year B. Tech Civil Engineering

Course Objectives:

To develop students' ability to analyze community infrastructure issues and design sustainable, socially responsible civil engineering solutions through field engagement.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE400FP1.1	Examine infrastructure systems, soil parameters, drinking water quality, and climate change impacts for sustainable planning and assessment.	C-3
3CE400FP1.2	Perform field-based activities like site inspection, sample collection, field testing, systematic data recording, and preliminary analysis for hands-on experience in real-world.	P-5
3CE400FP1.3	Demonstrate awareness and ethical concern towards sustainable management for fostering community engagement and social responsibility.	C-3, P-5 A-3

Course Contents:

Module	Description	Hours
Module 1	Orientation & Sensitization	4
Module 2	Field Visit & Problem Identification	24
Module 3	Problem–Solution Design & Implementation	20
Module 4	Documentation, Presentation & Reflection	12

Note:

- Students must perform collaboratively within their assigned practical batch groups only.
- Projects**
 - Field Visit to Swach Bharat Project Sites
 - Soil Health Testing and Drinking Water Quality Analysis
 - Climate Change Awareness and Community Impact Assessment
- Suggested Civil Project Themes**
 - Sustainable Rural Infrastructure & Livelihood Engineering
 - Water, Sanitation & Public Health Engineering

3. Climate Resilient & Disaster-Prepared Communities
4. Rural Resource Management & Environmental Engineering
5. Urban & Rural Governance Infrastructure Study
6. Community-Based Construction & Quality Control
7. Educational & Social Infrastructure Audit

4. Documentation /Project Report Format:

The Documentation /Project Report shall contain the following sections:

1. Title Page
2. Certificate & Declaration
3. Abstract
4. Introduction (Community + E&TC relevance)
5. Objectives
6. Literature Survey
7. Methodology (Survey + Technical)
8. Problem Identification
9. Proposed E&TC Solution
10. Implementation / Simulation
11. Results & Analysis
12. Community Feedback & Social Impact
13. Conclusion & Future Scope
14. References
15. Appendices (Photos, questionnaires, certification letter issued by the Gram Panchayat office)

Course Plan:

Lecture No.	Module Title	Topic	Hours
1	Module1: Orientation & Sensitization	NEP 2020: Community Engagement & Role of Engineers, Ethics, Social Responsibility & SDGs for Civil Engineers, Overview of Rural & Urban Communication Infrastructure, Identification of Community Institutions (GP, School, Self Help Group (SHG), Health Centre), Field Safety, Team Formation, Area & Theme Allocation, Reorganization	4
2	Module 2: Field Visits & Problem Identification	Pre-Visit Study, Permissions & Planning	24
3		Site Identification & Layout Documentation	
4		Field Data Collection & Technical Observation	
5		Laboratory/Field Testing & Data Recording	
6		Analysis & Comparison with Standards	
7		Problem Identification & Engineering Solutions	
8	Module3: Engineering Problem-Solution Design & Implementation-	Analysis of Collected Field Data and Identification of Problems	20
9		Preparation of Simple Layout Sketches of Existing Facilities, Preparation of Basic Improvement Plan	
10		Identification of Basic Civil Engineering Deficiencies in Infrastructure	
11		Preparation of Quantity and Cost Estimate	
12		Evaluation of Feasibility and Expected Community Benefits	
13	Module4: Documentation, Presentation & Reflection	Data Analysis & Graphical Representation, Writing Methodology & Analysis Sections, Results, Discussion & Conclusion	12
14		Project Report Structure & Guidelines, Report Finalization, Presentation Preparation	
15		Evaluation and Viva	

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE400FP1.1	3	-	2	3	3	3	2	3	3	-	3	3	3	1
3CE400FP1.2	3	-	-	3	3	-	-	3	3	3	3	3	3	1
3CE400FP1.3	3	-	-	-	-	3	3	3	3	2	3	3	3	1
3CE400FP1CO	3	-	1	2	2	2	2	3	3	2	3	3	3	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: 5	Course Code: 3AL001NC1			Course Category: NC	
Course Name	Disaster Management and Preparedness				
Credits	--	Total L:T:P Hours	2:0:0 30 Hrs	Total SL Hours	--
Total Credit Hours	--				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	--	PA Marks	--	Total Marks	--

Course Description:

Subject Code 3CE001NC1 Disaster Management and Preparedness is a Compulsory Non-Credit course for Second Year B. Tech all disciplines.

Course Objectives:

The objective of this course is to provide students with a comprehensive understanding of disasters, their types, impacts, the complete disaster management cycle, and the roles of various agencies in Disaster Risk Reduction.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE001NC1.1	Identify the concepts of disaster, hazard, vulnerability and risk, and classify disasters to understand the basic nature, causes and profiles of disasters in India.	C-2
3CE001NC1.2	Analyze the disaster management cycle for risk assessment, mitigation, preparedness, response, recovery, and international disaster management frameworks.	C-4
3CE001NC1.3	Apply disaster management practices, including stakeholder roles, national policies, engineers' responsibilities, and preparedness measures for effective disaster risk reduction.	C-3

Course Contents:

Unit 1	Introduction to Disaster Management: Concepts and definitions – disaster, hazard, vulnerability, risk, severity, frequency, exposure, capacity, and impact; classification of disasters- Natural disasters: earthquakes, tsunami, landslides, mining, Hydro-Meteorological Disasters: floods, draught, cyclones, coastal erosion. Biological Disaster: epidemics, pest attacks, forest fire, Manmade disasters: Industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, vulnerability profile of India, ecological fragility; principles of disaster prevention and mitigation	10 hrs
Unit 2	Disaster Management Cycle and Framework: Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development. Awareness During Disaster – Evacuation, Disaster Communication, Search and Rescue, Emergency Operation	12 hrs

	Centre, Incident Command System, Relief and Rehabilitation. Post-disaster – Damage and Needs Assessment, Restoration of Critical Infrastructure, Early Recovery, Reconstruction and Redevelopment; IDNDR, Yokohama Strategy, Hyogo Framework of Action Phases of disaster management; vulnerability and capacity assessment, post-disaster environmental response	
Unit 3	Disaster Management practices: Roles and responsibilities of government, community, local bodies, NGOs, and other stakeholders, National Policy on Disaster Management Act 2005 Mega Disasters of India and Lessons Learnt, Disaster Management practices at working and residential places. Key responsibility of engineers in disaster reduction techniques, medical preparedness aspect of disaster.	8 hrs

Textbooks:

1. Sharma, S. C. (2022). Disaster Management, Khanna Publication.
2. Subramanian, R. (2024). Disaster Management. Vikas Publication.

Reference Books:

1. Gaur, R. C. (2018). Environmental Engineering and Disaster Management. New Age International.
2. Pradeep Sahni, 2024, Disaster Risk Reduction in South Asia, Prentice Hall.
3. Mondal, D. (2022). Disaster Management. New Delhi: CBS Publishers & Distributors
4. Manual on natural disaster management in India, M C Gupta, NIDM, New Delhi
5. An overview on natural & man-made disasters and their reduction, R K Bhandani, CSIR, New Delhi
6. Natural Disaster Management Policy , 2009,GOI
7. H.N. Shrivastava& G.D. Gupta, Management of Natural Disasters in developing Countries, Daya Publishers , Delhi
8. S.L. Goyal, Encyclopedia of disaster Management, Vol I,II & III Disaster Managemnt Policy and administration, Deep & Deep, New Delhi,2006
9. Coppola D P, Introduction to International Disaster Management, Elsevier Science (B/H), London, 2007
10. Disaster Mitigation in Asia & Pacific, Asian Development Bank

Course Assignments

Internal Assessment at Institute level will be based on following assignments:

- 1) Study of Recent Disasters (at local, state and national level)
- 2) Preparation of Disaster Risk Management Plan of and Area or Sector
- 3) A Case study on Disaster Management

E Recourses:

1. https://onlinecourses.swayam2.ac.in/ntr25_ed61/preview

Mapping of COs with POs & PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE001NC1.1	3	2	-	-	-	3	2	-	-	-	3	-	-	-
3CE001NC1.2	3	3	-	-	-	3	3	-	-	-	3	2	2	-
3CE001NC1.3	3	3	-	-	-	3	3	-	-	3	3	1	2	2
3CE001NC1.CO	3	3	-	-	-	3	3	-	-	1	3	1	2	1

Correlation levels- 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: 5	Course Code: 3CE211DH1		Course Category: DH		
Course Name	Smart Cities and Urban Innovation				
Credits	03	Total L:T:P Hours	3:0:0	Total SL Hours	45 Hrs
Total Credit Hours	90 Hrs		45 Hrs		
SEE Marks	60	SEE Time	3 Hrs	CIA Marks	40
EE Marks	--	PA Marks	--	Total Marks	100

Course Description:

Subject Code 3CE211DH1 Smart Cities and Urban Innovation is an Honours / Double minor course (L 5) offered by department of Civil Engineering for Second Year B. Tech., all disciplines.

Course Objectives:

The objective of this course is to develop foundational understanding of smart city concepts, dimensions, policies, stakeholders, and global best practices for sustainable and digitally enabled urban development.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3CE211DH1.1	Describe the concept, evolution, characteristics, and need of smart cities, for digital transformation in modern urban systems.	C-2
3CE211DH1.2	Analyze the six core dimensions of smart cities and their inter linkages for achieving sustainable urban development.	C-4
3CE211DH1.3	Interpret urbanization trends and major urban challenges, including inclusivity and resilience requirements in Indian and global contexts.	C-2
3CE211DH1.4	Describe the objectives, structure, financing mechanisms, and ICT integration for the Smart Cities Mission in India, including the role of SPVs and ULBs.	C-2
3CE211DH1.5	Examine the roles and interactions of stakeholders in the smart city ecosystem and assess Public-Private Partnership (PPP) models for collaborative urban development.	C-3
3CE211DH1.6	Compare global smart city case studies and identify best practices applicable to Indian urban development strategies.	C-5

Course Contents:

Unit 1	Introduction to Smart Cities: Definition and origin of smart cities, importance of smart city, Characteristics of a smart city, smart cities: Need and benefits, Historical evolution of cities toward smart urbanism, Introduction to urban systems and digital transformation	7 hrs
Unit 2	Core Dimensions Smart Cities: Introduction to six dimensions and their importance: Smart Governance, Smart People, Smart Economy, Smart Living, Smart Mobility, Smart Environment, Interlinking of dimensions	8 hrs

	for sustainable development, Examples from real-life projects	
Unit 3	Urbanization Trends and Challenges: Urbanization in India and the world: Current trends, Common urban challenges: Traffic, waste, energy, housing, services, The digital divide and inclusive development, Urban-rural linkages and peri-urban development, Need for resilience and disaster preparedness in cities	7 hrs
Unit 4	Smart Cities Mission: Overview of the Smart Cities Mission (India), Vision, planning model (pan-city and area-based development), Introduction to Financing and implementation mechanisms, Use of ICT, IoT, and e-Governance tools in Indian smart cities, Role of Smart City SPVs and Urban Local Bodies (ULBs)	8 hrs
Unit 5	Stakeholders in Smart City Ecosystem: Role of government (local, state, central), Role of private sector: Investors, developers, and tech providers, Citizen engagement: Awareness, participation, and innovation, Academia and research institutions in urban innovation, Public-Private Partnership (PPP) models and collaboration tools	7 hrs
Unit 6	Best Practices and Case Studies: Smart city models from: Barcelona – Citizen engagement and governance, Singapore – Urban mobility and digital services, Amsterdam – Environmental and energy solutions, Lessons for Indian smart cities, Comparative analysis of strategies and outcomes	8 hrs

Text Books

1. Smart Cities: Foundations, Principles, and Applications by Houbing Song, Ravi Srinivasan
2. Smart Cities Unbundled: Ideas and Strategies for Urban India by Sameer Sharma

Reference Books:

1. Designing Smart and Resilient Cities for a Post-Pandemic World by Anthony M. Townsend

E Resources:

1. <https://upskilldevelopment.com/urban-innovation-management-and-smart-cities-course>

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE211DH1.1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
3CE211DH1.2	3	-	-	-	-	-	2	-	-	-	-	-	-	-
3CE211DH1.3	3	-	-	-	-	-	2	-	-	-	1	-	2	-
3CE211DH1.4	3	-	-	-	-	-	2	-	-	-	-	-	3	-
3CE211DH1.5	3	-	-	-	3	-	2	-	-	-	-	-	-	-
3CE211DH1.6	3	-	-	-	-	-	2	-	-	-	3	-	3	-
3CE211DH1.CO	3	-	-	-	1	-	2	-	-	-	1	-	2	-

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: 5	Course Code: 3CE211DH2		Course Category: DH		
Course Name	Basics of HVAC				
Credits	03	Total L:T:P Hours	3:0:0 45 Hrs	Total SL Hours	45 Hrs
Total Credit Hours	90 Hrs				
SEE Marks	60	SEE Time	3 Hrs	CIA Marks	40
EE Marks	--	PA Marks	--	Total Marks	100

Course Description:

Subject Code 3__211DH2 Basics of HVAC is an Honours / Double minor course (L 5) offered by department of Civil Engineering for Second Year B. Tech., all disciplines.

Course Objectives:

The objective of this course is to provide a foundational understanding of HVAC (Heating, Ventilation, and Air Conditioning) systems relevant to building and industrial applications.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
3__211DH2.1	Explain various HVAC systems and their role in building development to enhance sustainability, indoor air quality (IAQ), and smart HVAC integration.	C2
3__211DH2.2	Apply the principles of thermodynamics to evaluate and improve the efficiency and thermal performance of HVAC systems.	C3
3__211DH2.3	Interpret psychrometric charts and calculate air properties to analyze air-conditioning and HVAC process problems.	C3
3__211DH2.4	Calculate heating and cooling loads to determine the required system capacity by identifying influencing factors using standard load estimation methods.	C3
3__211DH2.5	Explain the working principles of refrigeration and heating equipment and differentiate between HVAC configurations to select appropriate systems for specific applications.	C4
3__211DH2.6	Design air distribution systems and demonstrate the application of HVAC controls and BMS to achieve improved energy efficiency and sustainable building performance.	C6

Course Contents:

Unit 1	Introduction to HVAC Systems: Definition, scope, and classification of HVAC systems, Role of HVAC in buildings and industries, Historical background and current trends (e.g., sustainability, IAQ, smart HVAC), Components and subsystems of HVAC systems.	7 hrs
Unit 2	Thermodynamics and Heat Transfer Fundamentals: Review of first and second laws of thermodynamics, Heat transfer modes (conduction, convection, and radiation), Heat transfer through building materials, Energy balance and efficiency in HVAC systems.	8 hrs
Unit 3	Psychrometrics and Air Properties: Moist air properties, Dalton's law, Psychrometric chart: dry bulb, wet bulb, relative humidity and enthalpy. Air conditioning processes: sensible and latent heating/cooling, dehumidification, mixing, bypass factor, Application of psychrometrics in HVAC calculations	7 hrs
Unit 4	Cooling and Heating Load Estimation: Factors affecting heating/cooling load, Internal and external heat gains, Solar radiation and ventilation loads, Load estimation procedures (CLTD, TETD, and RTS methods), Design conditions and selection of equipment capacity.	8 hrs
Unit 5	HVAC Equipment and System Configuration: Refrigeration cycles: vapour compression and absorption systems. HVAC equipment: compressors, condensers, evaporators, expansion devices. Heating equipment: boilers, heat pumps, fans, blowers, air filters. HVAC system types: all-air, all-water, air-water, split and packaged units	7 hrs
Unit 6	Air Distribution and Controls: Duct design: friction loss, pressure drop, duct sizing methods - Diffusers, grilles, dampers. Air distribution layouts. Basic controls: thermostats, sensors, actuators. Introduction to Building Management Systems (BMS), Energy efficiency considerations and green building concepts.	8 hrs

Text Books

1. C.P. Arora – Refrigeration and Air Conditioning, Tata McGraw-Hill Education.
2. S.C. Arora & Domkundwar – A Course in Refrigeration and Air Conditioning, Dhanpat Rai & Sons
3. Ananthanarayanan, P.N. – Basic Refrigeration and Air Conditioning, McGraw Hill Education.

Reference Books:

1. ASHRAE Handbook Series – Fundamentals, HVAC Applications, HVAC Systems and Equipment.
2. Carrier Air Conditioning Co. – Handbook of Air Conditioning System Design, McGraw Hill.
3. Jones, W.P. – Air Conditioning Engineering, Butterworth-Heinemann.

E Recourses:

1. <https://pdhonline.com/courses/m135/m135content.pdf?utm>
2. <https://www.aaon.com/resources/navigating-psychrometric-charts-a-beginners-guide?utm>.
3. <https://www.engproguides.com/hvac-psychrometrics-problems.html?utm>.

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
3CE211DH2.1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
3CE211DH2.2	3	-	-	-	-	-	2	-	-	-	-	-	-	-
3CE211DH2.3	3	-	-	-	-	-	2	-	-	-	1	-	2	-
3CE211DH2.4	3	-	-	-	-	-	2	-	-	-	-	-	3	-
3CE211DH2.5	3	-	-	-	3	-	2	-	-	-	-	-	-	-
3CE211DH2.6	3	-	-	-	-	-	2	-	-	-	3	-	3	-
3CE211DH2.CO	3	-	-	-	1	-	2	-	-	-	1	-	2	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: 5	Course Code: 4CE212PC1		Course Category: PCC		
Course Name	Surveying				
Credits	03	Total L:T:P Hours	3:0:0 45 Hrs	Total SL Hours	45 Hrs
Total Credit Hours	90 Hrs				
SEE Marks	60	SEE Time	3 Hrs	CIA Marks	40
EE Marks	--	PA Marks	--	Total Marks	100

Course Description:

Subject Code 3CE203PC1 Surveying is a compulsory Program core course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to equip students with the knowledge and skills to perform land surveys, measure distances, and create accurate maps for construction projects using modern and traditional methods.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE212PC1.1	Explain surveying concepts, principles, and applications across civil engineering domains to understand spatial measurement relevance in infrastructure planning.	C-2
4CE212PC1.2	Apply linear and angular measurement procedures using chains, tapes, EDM and compasses to minimize errors and improve field measurement accuracy.	C-3
4CE212PC1.3	Demonstrate levelling operations and contouring techniques with appropriate adjustments to determine elevations and represent surface terrain effectively.	C-3
4CE212PC1.4	Demonstrate setup, operation, and data collection using Total Station instruments for layout, and civil engineering surveying applications.	C-3
4CE212PC1.5	Interpret principles of photogrammetry and drone surveying to plan aerial surveys and generate spatial data for mapping and construction monitoring.	C-2
4CE212PC1.6	Explain the use of Remote Sensing, GPS, and GIS technologies including QGIS software for modern geospatial data collection, and decision-making in civil engineering projects.	C-2

Course Contents:

Unit 1	Introduction to Surveying: Definition and scope of surveying, Surveying Principles, Importance of surveying in civil engineering, Applications of surveying in urban planning, transportation, construction, and environmental engineering, Types of surveying (topographical, cadastral, engineering, geodetic, etc.), Surveying units and conversions.	6 hrs
Unit 2	Measurement Techniques: Introduction to linear measurement, Types of tapes/chains/EDM used in surveying, Procedures for chain surveying, Types of errors in surveying (systematic, random, and gross errors), Measurement errors and correction techniques, Importance of angular measurements in surveying, Use of prismatic and surveyor's compass Bearings and angles, local attraction errors and adjustments.	7 hrs
Unit 3	Levelling Techniques and Contour Mapping: Various terms, Methods of height determination, Spirit leveling, different types of levels, booking and reduction of data, profile leveling and cross sectioning, and collimation errors, reciprocal leveling. Contours and its characteristics, uses and methods of contouring.	7 hrs
Unit 4	Modern Surveying using Total Station: Introduction to Total Station, Definition and concept of Total Station, Components of Total Station, Advantages and limitations, Working Principle, Measurement of Horizontal & Vertical Angles, Distance measurement, Data collection and storage, Field Operations with Total Station, Applications in Civil Engineering	7 hrs
Unit 5	Photogrammetry and Drone Surveying: Definition and principles of photogrammetry, Types: Terrestrial and Aerial Photogrammetry , Types of photographs: Vertical & Oblique photos, Scale of vertical photograph, Drone Integration, Types of drone cameras, Camera calibration in drones, Ground Control Points (GCPs) for drone mapping, Flight Planning and Image Acquisition, Drone-Based Survey Applications, Introduction to photogrammetry software (Pix4D / Drone Deploy).	8 hrs
Unit 6	Geospatial Technologies: Remote Sensing: Definition and principles of Remote Sensing, Remote Sensing Systems, Characteristics of major Indian Remote Sensing Satellites, Global Positioning System (GPS): Introduction and definition of GPS, Types of GPS surveying, Advantages of GPS in Civil Engineering, Geographic Information System (GIS): Definition and History of GIS, Components of GIS, Spatial and Non-spatial data, Applications of RS, GPS, GIS, Overview of QGIS software.	10 hrs

Text Books:

1. B. C. Punmia, Surveying Vol. I, Laxmi Publications.
2. S. K. Duggal, Surveying Vol. I & II, McGraw-Hill Education.
3. K. R. Arora, Surveying Vol. I, Standard Book House.

Reference Books:

1. Charles D. Ghilani & Paul R. Wolf, Elementary Surveying: GPS, GIS and Geomatics, Pearson Education.
2. A. M. Chandra, Plane Surveying, New Age International Publishers.

E Resources:

1. <https://nptel.ac.in/courses/105/104/105104101>
2. <https://opentextbc.ca/geomatics>

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE212PC1.1	3	2	-	-	-	-	-	-	-	-	-	2	2	-
4CE212PC1.2	3	2	-	2	3	-	-	-	-	-	-	3	2	-
4CE212PC1.3	3	2	-	2	3	-	-	-	-	-	-	3	2	1
4CE212PC1.4	3	2	-	2	3	-	-	-	-	-	-	3	2	1
4CE212PC1.5	3	2	-	2	3	-	-	-	-	-	-	2	3	-
4CE212PC1.6	3	2	-	2	3	3	-	-	-	-	-	2	3	-
4CE212PC1.CO	3	2	-	2	2	1	-	-	-	-	-	3	3	1

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial(High)

Level: 5	Course Code: 4CE213PC1			Course Category: PCC	
Course Name	Concrete Technology				
Credits	02	Total L:T:P Hours	2:0:0	Total SL Hours	30 Hrs
Total Credit Hours	60 Hrs		30 Hrs		
SEE Marks	60	SEE Time	3 Hrs	CIA Marks	40
EE Marks	--	PA Marks	--	Total Marks	100

Course Description:

Subject Code 4CE213PC1 Concrete Technology is a compulsory Program core course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to provide students insights of concrete materials, mix design, properties, testing, special concretes, and quality control practices essential for durable and efficient construction applications.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE213PC1.1	Explain concrete composition, water-cement ratio, properties, and influencing factors to understand behavior of concrete in construction applications effectively.	C-2
4CE213PC1.2	Discuss cement types, aggregate properties, testing methods, water quality, and admixture functions to evaluate material suitability for producing quality concrete mixes.	C-2
4CE213PC1.3	Apply IS 10262:2019 mix design steps considering workability, strength, durability, and material variations to achieve required concrete performance reliably.	C-3
4CE213PC1.4	Analyze workability, segregation, bleeding, durability factors, and measurement methods to assess fresh and hardened concrete behavior under varying construction conditions.	C-4
4CE213PC1.5	Analyze the production, batching, transportation, and quality control processes of Ready-Mix Concrete to evaluate its compliance with IS 456 and IS 4926 standards.	C-4
4CE213PC1.6	Interpret concrete types, acceptance criteria, protection techniques, and repair practices to maintain consistent concrete quality and ensure structural durability.	C-2

Course Contents:

Unit 1	Unit 1: Fundamentals of Concrete and Constituent Materials Introduction to concrete technology, classification of concrete, ingredients of concrete, types and characteristics of cement, hydration of cement and heat of hydration, water-cement ratio, properties of concrete, factors affecting strength and durability.	4 hrs
Unit 2	Unit 2: Properties and Testing of Concrete Materials Testing on cement, classification and properties of aggregates, water quality requirements and impurities affecting concrete, types of chemical and mineral admixtures, IS standards and specifications related to concrete materials.	5 hrs
Unit 3	Unit 3: Concrete Mix Design Introduction to mix design, factors influencing mix design, guidelines of IS 10262: 2019, calculation of target mean strength, selection of water content and water-cement ratio, determination of cement content and aggregate proportions, preparation of trial mixes and necessary adjustments, compressive, tensile and flexural strength of concrete, curing methods and their importance, shrinkage and creep of concrete.	6hrs
Unit 4	Unit 4: Fresh and Hardened Concrete Properties of fresh concrete including workability, segregation bleeding, and temperature effect, measurement methods of workability, properties of hardened concrete including strength development, modulus of elasticity, durability of concrete: sulphate attack, carbonation, chloride attack, alkali-aggregate reaction and abrasion resistance.	5 hrs
Unit 5	Unit 5: Ready Mix Concrete (RMC) and Production Technology Introduction to Ready Mix Concrete, types of RMC plants including transit mix, central mix and shrink mix plants, batching and mixing operations, transportation and placement of RMC, quality control measures at plant and site, acceptance criteria as per IS 456 and IS 4926.	6 hrs
Unit 6	Unit 6: Special Concretes and Quality Control High-performance concrete, high-strength concrete and lightweight concrete, quality control in concrete production, acceptance criteria and statistical quality control, concrete protection techniques, repair and retrofitting of concrete structures.	4 hrs

Text Books:

1. Shetty M.S., Concrete Technology, S. Chand Publishing
2. Neville A.M., Properties of Concrete, Pearson Education
3. Gambhir M.L., Concrete Technology, Tata McGraw-Hill

Reference Books:

1. Mehta P.K. & Monteiro P.J.M., Concrete: Microstructure, Properties and Materials, McGraw-Hill
2. Rajput R.K., Engineering Materials, S. Chand Publishing

E Resources:

1. <https://civiconcepts.com/>
2. <https://engineeringcivil.com>

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE213PC1.1	3	2	-	-	-	-	-	-	-	-	-	1	-	-
4CE213PC1.2	3	2	-	-	-	-	-	-	-	-	-	-	3	-
4CE213PC1.3	3	2	-	-	-	-	-	-	-	-	-	-	3	1
4CE213PC1.4	3	2	-	-	-	-	-	-	-	-	-	-	2	-
4CE213PC1.5	3	2	-	-	-	-	-	-	-	-	-	-	2	-
4CE213PC1.6	3	2	-	-	-	-	-	-	-	-	-	-	2	1
4CE213PC1.CO	3	2	-	-	-	-	-	-	-	-	-	1	2	1

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial(High)

Level: 5	Course Code: 4CE214PC1			Course Category: PCC	
Course Name	Fluid Mechanics				
Credits	02	Total L:T:P Hours	2:0:0 30 Hrs	Total SL Hours	30 Hrs
Total Credit Hours	60 Hrs				
SEE Marks	60	SEE Time	3 Hrs	CIA Marks	40
EE Marks	--	PA Marks	--	Total Marks	100

Course Description:

Subject Code 4CE214PC1 Fluid Mechanics is a compulsory Program core course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to develop understanding of fundamental fluid properties, hydrostatics, fluid kinematics, flow measurement, dimensional analysis and open channel hydraulics for solving real civil engineering flow problems.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE214PC1.1	Explain physical properties of fluids, viscosity, capillarity and pressure measurement to understand fluid behaviour under different conditions.	C-2
4CE214PC1.2	Determine total pressure and centre of pressure on submerged surfaces to design hydraulic structures effectively.	C-3
4CE214PC1.3	Apply the principles of buoyancy and floatation to determine metacentric height for analyzing stability and equilibrium of floating and submerged bodies.	C-3
4CE214PC1.4	Apply Euler's and Bernoulli's equations along streamlines to solve practical hydraulic and energy distribution problems.	C-3
4CE214PC1.5	Examine pipe combinations in series and parallel for planning efficient water transportation systems.	C-3
4CE214PC1.6	Explain uniform and non-uniform open channel flow characteristics to classify flow behaviour accurately.	C-2

Course Contents:

Unit 1	Properties of Fluids: Introduction, Physical properties of fluids, viscosity, capillarity, Pressure and its measurement: Fluid pressure at a point, Pascal's Law, pressure variation in a fluid at rest, absolute gauge, atmospheric & vacuum pressures, measurement of pressure, simple manometers, differential manometers, related problems.	5 hrs
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Unit 2	Hydrostatic forces on surfaces: Introduction, total pressure & center of pressure, vertical plane and Inclined Plane surface submerged in liquid.	5 hrs
Unit 3	Buoyancy & floatation: Introduction, buoyancy, centre of buoyancy, metacentre, metacentric height, analytical method of metacentric height, conditions of equilibrium of a floating & submerged body, related problems.	5 hrs
Unit 4	Dynamics of Flow: Eulers equation of motion along a streamline and its integration to prove Bernoulli's equation, its assumptions, HGL, EGL, related problems	5 hrs
Unit 5	Measurement of fluid flow: Flow through pipes, Velocity Distribution law, Hydrodynamically smooth and rough pipe, Darcy's equation (no proof), major and minor losses in pipes, pipes in series and parallel.	5 hrs
Unit 6	Open channel flow: Uniform flow, Open channel flow, Types of flow, geometric elements of rectangular & trapezoidal sections, Chezy's & Mannings equations, most efficient rectangular & trapezoidal section	5 hrs

Text Books:

1. R.K. Bansal, Fluid Mechanics, Laxmi Publications.
2. R. Jain & S.S. Kori, Fluid Mechanics and Hydraulics, Dhanpat Rai Publications.

Reference Books:

1. F.M. White, Fluid Mechanics, McGraw Hill
2. K. Subramanya, Flow in Open Channels, McGraw Hill Education

E Resources:

1. <https://nptel.ac.in/courses/112/105/112105174>

Mapping of COs with POs and PSOs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE214PC1.1	3	2	-	-	-	-	-	-	-	-	-	2	-	-
4CE214PC1.2	3	2	-	-	-	-	-	-	-	-	-	2	2	-
4CE214PC1.3	3	2	-	-	-	-	-	-	-	-	-	-	1	-
4CE214PC1.4	3	2	-	-	2	-	-	-	-	-	-	-	1	-
4CE214PC1.5	3	2	-	-	-	-	-	-	-	-	-	-	2	-
4CE214PC1.6	3	2	-	-	3	-	-	-	-	-	-	-	-	-
4CE214PC1.CO	3	2	-	-	1	-	-	-	-	-	-	2	2	-

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial(High)

Level: 5	Course Code: 4CE215MD1		Course Category: MDM		
Course Name	Surveying				
Credits	02	Total L:T:P Hours	2:0:0 30 Hrs	Total SL Hours	30 Hrs
Total Credit Hours	60 Hrs				
SEE Marks	30	SEE Time	2 Hrs	CIA Marks	20
EE Marks	--	PA Marks	--	Total Marks	50

Course Description:

Subject Code 4CE215MD1 Surveying is a Multidisciplinary Minor course for Second Year B. Tech Textile/Mechanical/Electrical/Computer Science/EXTC/Chemical Engineering.

Course Objectives:

The objective of this course is to equip students with the knowledge and skills to perform land surveys, measure distances, and create accurate maps for construction projects using modern and traditional methods.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE215MD1.1	Explain advanced surveying principles, applications, and modern techniques like GIS, GPS, and remote sensing to support multidisciplinary engineering tasks effectively.	C-2
4CE215MD1.2	Apply precise linear, angular, and elevation measurement methods with error adjustments to obtain reliable field observations for practical surveying works.	C-3
4CE215MD1.3	Interpret total station, GPS, and digital mapping outputs to prepare accurate spatial data representations supporting planning and design decision-making.	C-3

Course Contents:

Unit 1	Surveying Concepts and Instruments: Overview of advanced principles of surveying, scope and applications in civil engineering and planning, classification of land surveys, detailed study of linear and angular measurements, use of chains, tapes, prismatic compass, surveyor's compass, sources of errors and correction methods, local attraction and its adjustments, field procedures for chain and compass surveying, introduction to plane table operations and accuracy considerations.	12 hrs
Unit 2	Elevation Determination and Contouring Concepts related to height measurement, spirit leveling principles, types of levels and leveling staff, field procedures for differential, profile, and cross-section leveling, booking of readings and reduction of levels using both height of instrument and rise and fall methods, identification and adjustment of collimation errors,	12 hrs

	reciprocal leveling for accuracy improvement, concept, characteristics, uses, and generation methods of contour maps for terrain representation.	
Unit 3	Modern Surveying Technologies Introduction to total station operation and data acquisition, fundamentals of GPS positioning and its surveying applications, role of GIS, remote sensing, and UAV or drone-based surveying in mapping, planning, and land information systems.	6 hrs

Text Books:

1. B. C. Punmia, Surveying Vol. I, Laxmi Publications.
2. S. K. Duggal, Surveying Vol. I & II, McGraw-Hill Education.
3. K. R. Arora, Surveying Vol. I, Standard Book House.

Reference Books:

1. Charles D. Ghilani & Paul R. Wolf, Elementary Surveying: GPS, GIS and Geomatics, Pearson Education.
2. A. M. Chandra, Plane Surveying, New Age International Publishers.

E Resources:

1. <https://nptel.ac.in/courses/105/104/105104101>
2. <https://opentextbc.ca/geomatics>

Mapping of COs with POs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
4CE215MD1.1	3	2	-	-	-	-	-	-	-	-	-
4CE215MD1.2	3	2	-	-	-	-	-	-	-	-	-
4CE215MD1.3	3	2	-	-	-	-	-	-	-	-	-
4CE215MD1.CO	3	2	-	-	-	-	-	-	-	-	-

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial(High)

Level: 5	Course Code:		4SH216OE1	Course Category:	OE
Course Name	Quantitative and Logical Reasoning				
Credits	03	Total L:T:P Hours	3:0:0	Total SL Hours	45 Hrs
Total Credit Hours	90 Hrs		45 Hrs		
SEE Marks	60	SEE Time	3 Hrs	CIA Marks	40
EE Marks	--	PA Marks	--	Total Marks	100

Course Description:

Subject Code 4SH216OE1 Quantitative and Logical Reasoning is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The Objective of the Course is to develop quantitative aptitude, logical reasoning, problem-solving efficiency, and decision-making skills for placements, competitive exams, and real-life applications

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE1.1	Apply arithmetic and numerical techniques to solve quantitative problems accurately.	C-3
4SH216OE1.2	Solve algebraic and equation-based problems using simplification and approximation methods to improve problem-solving efficiency.	C-3
4SH216OE1.3	Analyze logical reasoning problems using structured and critical thinking approaches to improve decision-making skills.	C-4
4SH216OE1.4	Interpret and analyze data using graphical and tabular methods for decision making for strategic planning.	C-4
4SH216OE1.5	Solve complex logical puzzles and advanced reasoning problems efficiently for competitive examination success.	C-3
4SH216OE1.6	Demonstrate effective aptitude test strategies integrating quantitative and logical reasoning skills for career advancement opportunities.	C-3

Course Contents:

Unit 1	Number System & Arithmetic Foundations: Number system fundamentals; LCM and HCF applications; divisibility rules; percentage calculations; ratio and proportion; averages; profit and loss; simple and compound interest; speed mathematics and shortcut techniques.	7Hrs
Unit 2	Algebra, Equations & Simplification Techniques: Linear and quadratic equations; algebraic expressions; simplification and approximation; indices and surds; inequalities; time and work; pipes and cisterns; time, speed and distance; mixtures and alligation.	7 Hrs
Unit	Logical Reasoning: Analytical & Critical Thinking:	7 Hrs

3	Coding–decoding; blood relations; direction sense; series and pattern recognition; analogies; ranking and ordering; syllogisms; statement and assumption; statement and conclusion; cause–effect reasoning.	
Unit 4	Data Interpretation & Analytical Aptitude: Tables; pie charts; line graphs; bar graphs; caselets; data sufficiency; DI shortcut techniques; approximation in data interpretation; comparative and predictive data analysis.	8Hrs
Unit 5	Advanced Logical Reasoning & Puzzle Solving: Seating arrangements (linear, circular, and complex); floor-based puzzles; scheduling puzzles; selection-based puzzles; Venn diagrams; logical grouping; critical reasoning frameworks	8 Hrs
Unit 6	Placement Aptitude Mastery & Test Strategies: Integrated quantitative and logical reasoning practice; decision-making and elimination strategies; speed improvement techniques; mock placement aptitude patterns (TCS, Infosys, Wipro, Accenture, Capgemini); common error analysis; test-taking strategies; aptitude and reasoning simulations.	8 Hrs

Text Books:

1. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publishing
2. Arun Sharma, Logical Reasoning and Data Interpretation, McGraw Hill

Reference Books:

1. Arun Sharma, How to Prepare for Quantitative Aptitude, published by McGraw Hill Education.
2. R.S. Aggarwal, A Modern Approach to Logical Reasoning, published by S. Chand Publishing
3. M.K. Pandey, Analytical Reasoning, published by BSC Publishing Co. Pvt. Ltd.
4. Rajesh Verma, Fast Track Objective Arithmetic, published by Arihant Publications

E Resources:

1. NPTEL – Quantitative Aptitude & Logical Reasoning Courses
2. IndiaBIX – Quantitative and Logical Reasoning Practice
3. CareerRide – Aptitude Preparation Modules
4. PrepInsta / HackerEarth – Placement Aptitude Practice Platforms

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH216OE1.1	3	3	2	–	–	–	–	–	–	–	–	1	2	1
4SH216OE1.2	3	3	2	–	–	–	–	–	–	–	–	1	2	1
4SH216OE1.3	–	3	3	–	–	–	–	–	–	–	–	1	2	2
4SH216OE1.4	–	3	2	–	–	–	–	–	–	–	–	1	3	2
4SH216OE1.5	–	3	3	–	–	–	–	–	–	–	–	2	2	2
4SH216OE1.6	–	3	2	–	–	–	–	–	–	2	3	1	2	2
4SH216OE1 CO	1	3	3	–	–	–	–	–	–	1	1	1	2	2

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level:	5	Course Code:	4SH216OE2	Course Category:	OE
Course Name	Critical Thinking & Decision Making				
Credits	03	Total L:T:P Hours	3:0:0 45 Hrs	Total SL Hours	45 Hrs
Total Credit Hours	90 Hrs				
SEE Marks	60	SEE Time	3 Hrs	CIA Marks	40
EE Marks	--	PA Marks	--	Total Marks	100

Course Description:

Subject Code 4SH216OE2 Critical Thinking & Decision Making is a compulsory Open Elective Course for Second Year B. Tech All Branch Students.

Course Objectives:

The objective of this course is to develop critical thinking and decision-making competencies by strengthening analytical reasoning and structured problem-solving skills applicable to professional and real-world situations.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH216OE2.1	Apply critical thinking frameworks to analyze problems systematically.	C-3
4SH216OE2.2	Evaluate information, assumptions, and arguments for logical consistency and validity.	C-5
4SH216OE2.3	Analyze complex situations and identify feasible alternatives for decision making.	C-4
4SH216OE2.4	Design rational and ethical decision-making strategies under uncertainty to ensure sustainable organizational outcomes.	C-6 A-3
4SH216OE2.5	Apply quantitative and qualitative tools to support decision-making processes.	C-3
4SH216OE2.6	Demonstrate effective decision making in simulated professional and team-based scenarios to resolve workplace challenges effectively	C-3 P-3 A-3

Course Contents:

Unit 1	Foundations of Critical Thinking: Concept of critical thinking; elements of reasoning; logical vs illogical thinking; assumptions and inferences; inductive and deductive reasoning; common cognitive biases; barriers to critical thinking.	7Hrs
Unit 2	Analytical Reasoning & Problem Framing: Problem identification and structuring; root cause analysis; issue trees; questioning techniques; systems thinking; analytical reasoning models.	7 Hrs
Unit 3	Decision Making Models & Techniques: Rational decision-making model; intuitive decision making; bounded rationality; decision trees; cost-benefit analysis;	7 Hrs

	risk and uncertainty; heuristics.	
Unit 4	Data-Driven & Ethical Decision Making: Use of data in decision making; qualitative vs. quantitative data; basic decision matrices; ethical frameworks; professional ethics; social and environmental considerations in decisions.	8Hrs
Unit 5	Creativity, Innovation & Strategic Thinking: Creative thinking techniques; lateral thinking; design thinking approach; scenario planning; strategic decision making; innovation in problem solving.	8 Hrs
Unit 6	Applied Decision Making & Case Analysis: Case studies from industry and management; individual and group decision simulations; conflict resolution through decision frameworks; decision-making under pressure; reflection and feedback	8 Hrs

Text Books:

1. Alec Fisher, Critical Thinking, published by Cambridge University Press.
2. John Adair, Decision Making and Problem Solving, published by Kogan Page.

Reference Books:

1. Daniel Kahneman, Thinking, Fast and Slow published by Farrar, Straus and Giroux.
2. Rolf Dobelli, The Art of Thinking Clearly, published by Sceptre.
3. John S. Hammond, Ralph L. Keeney, Howard Raiffa, Smart Choices, published by Harvard Business School Press.
4. Ken Watanabe, Problem Solving 101, published by Portfolio.

E Resources:

1. NPTEL – Critical Thinking & Decision Making Courses
2. Coursera – Critical Thinking and Decision-Making Modules
3. Harvard Business Review – Decision Making Articles
4. MIT OpenCourseWare – Decision Analysis

Mapping of COs with POs & PSO

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH216OE2.1	2	3	2	–	–	–	–	–	–	–	–	1	2	2
4SH216OE2.2	–	3	3	–	–	–	–	–	–	–	–	1	2	2
4SH216OE2.3	–	3	2	–	–	–	–	–	–	–	–	1	2	2
4SH216OE2.4	–	3	3	–	–	2	3	–	–	–	–	–	3	2
4SH216OE2.5	–	2	2	–	2	–	–	–	–	–	–	2	3	2
4SH216OE2.6	–	2	2	–	–	2	–	2	2	–	2	1	2	2
4SH216OE2. CO	1	3	3	–	1	1	1	1	1	–	1	1	3	2

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High)

Level: 5	Course Code: 4CE217PC1		Course Category: PCC		
Course Name	Concrete Technology - Lab				
Credits	01	Total L:T:P Hours	0:0:2	Total SL Hours	--
Total Credit Hours	30 Hrs		30 Hrs		
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	25	PA Marks	25	Total Marks	50

Course Description:

Subject Code 4CE217PC1 Concrete Technology Lab is a compulsory Laboratory Program Core Course for Second Year B. Tech. Civil Engineering.

Course Objectives:

The objective of this course is to develop the ability to perform various tests and interpret results of ingredients of concrete and properties of fresh and hardened concrete.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE217PC1.1	Interpret cement and aggregate test results, workability measures, and concrete strength parameters to recognize material suitability and overall concrete performance effectively.	C-2 & P-1
4CE217PC1.2	Perform standardized procedures for material testing, workability evaluation, concrete mix design, and strength testing to develop accurate hands-on laboratory skills in concrete technology.	C-2 & P-4
4CE217PC1.3	Demonstrate responsibility and professional ethics during laboratory work and site visits by following safety norms and quality procedures to promote good construction practices	C-2, P-5 & A-1

List of Practicals:

Minimum Eight of mentioned below:

1. Determination of Fineness of Hydraulic Cement by Dry Sieving.
2. Determination of Soundness of Hydraulic Cement by Le-Chatelier Method.
3. Determination of Standard Consistency of Cement Paste.
4. Determination of Initial and Final Setting Time of Cement.
5. Determination of Compressive Strength of Hydraulic Cement.
6. Determination of Fineness Modulus of Fine and Coarse Aggregates by Sieve Analysis.
7. Determination of Bulking of Fine Aggregate.
8. Determination of Workability of Fresh Concrete by Slump Test.
9. Determination of Workability of Fresh Concrete by Compaction Factor Test.
10. Determination of Compressive Strength of Hardened Concrete.
11. Concrete Mix Proportioning by IS Method.

12. Study Visit to Ready Mix Concrete (RMC) Plant and Preparation of Technical Report.

E Resources:

1. <https://ms-nitk.vlabs.ac.in/>

References

1. IS 4031 (Part 1) – Methods of Physical Tests for Hydraulic Cement: (PR1).
2. IS 4031 (Part 3) – Methods of Physical Tests for Hydraulic Cement: (PR2).
3. IS 4031 (Part 4) – Methods of Physical Tests for Hydraulic Cement: (PR3).
4. IS 4031 (Part 5) – Methods of Physical Tests for Hydraulic Cement: (PR4).
5. IS 4031 (Part 6) – Methods of Physical Tests for Hydraulic Cement: (PR5).
6. IS 2386 (Part 1) – Methods of Test for Aggregates for Concrete: (PR6).
7. IS 2386 (Part 3) – Methods of Test for Aggregates for Concrete: (PR7).
8. IS 1199 – Methods of Sampling and Analysis of Concrete: (PR8, PR9).
9. IS 516 – Methods of Tests for Strength of Concrete (PR10).
10. IS 10262 – Concrete Mix Proportioning – Guidelines (PR11).
11. IS 4926 – Ready Mixed Concrete – Specification (PR12).

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE217PC1.1	3	2	-	2	3	-	-	-	-	-	-	3	1	2
4CE217PC1.2	3	2	-	3	3	-	-	-	-	-	-	3	2	2
4CE217PC1.3	3	2	-	-	-	2	3	2	2	-	-	3	2	3
4CE217PC1.CO	3	2	-	2	2	1	1	1	1	-	-	3	2	2

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial(High)

Level: 5	Course Code: 4CE218PC1		Course Category: PCC		
Course Name	Fluid Mechanics Lab				
Credits	01	Total L:T:P Hours	0:0:2 30 Hrs	Total SL Hours	--
Total Credit Hours	30 Hrs				
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	25	PA Marks	25	Total Marks	50

Course Description:

Subject Code 4CE218PC1 Fluid Mechanics Lab is a compulsory Laboratory Program Core Course for Second Year B. Tech. Civil Engineering.

Course Objectives:

The objective of this course is to experimentally determine fluid flow characteristics and hydraulic parameters using laboratory instruments, analyze discharge and energy principles, and validate theoretical fluid mechanics concepts essential for practical engineering applications.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE218PC1.1	Perform experiments such as Bernoulli's theorem verification, venturimeter, etc. to enhance hands-on fluid mechanics measurement and instrumentation competence.	P-5
4CE218PC1.2	Analyze discharge coefficients, friction factors, deflections and flow regimes to demonstrate experimental data and fluid flow behaviour accurately.	C-4 & P-5
4CE218PC1.3	Demonstrate calibration, experimental documentation and virtual simulation usage for developing ethical practice and collaborative skills in hydraulics.	P-5 & A-5

List of Practicals:

Minimum Eight of mentioned below:

1. Verification of Bernoulli's Theorem for Steady Incompressible Flow.
2. Determination of Coefficient of Discharge of a Venturimeter. (As per IS 8419)
3. Determination of Coefficient of Discharge of an Orifice Meter. (As per IS 2952 / IS 2378)
4. Determination of Metacentric Height of a Floating Body
5. Determination of Friction Factor for Flow through a GI Pipe
6. Determination of Coefficient of Discharge of a Triangular Notch (V-Notch Weir). (As per IS 6062)
7. Determination of Coefficient of Discharge of a Rectangular Notch (Rectangular Weir). (As per IS 6062)
8. Determination of Chezy's Coefficient for Uniform Flow in an Open Channel

9. Determination of Coefficient of Discharge of a Venturiflume. (As per IS 6062)
10. Verification of Momentum Equation for Impact of Jet on Vanes
11. Demonstration of Laminar and Turbulent Flow by Reynolds Experiment.
12. Calibration of Pressure Measuring Devices (Bourdon Gauge / U-Tube Manometer). (As per IS 3624 / IS 2952)

E Resources:

1. <https://fm-nitk.vlabs.ac.in/>
2. <https://www.pvgcoet.ac.in/virtual-lab>

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE218PC1.1	3	-	-	2	3	-	-	-	-	-	-	3	1	-
4CE218PC1.2	3	-	-	2	3	-	-	-	-	-	-	3	-	-
4CE218PC1.3	3	-	-	2	3	3	3	-	-	-	2	3	-	-
4CE218PC1.CO	3	-	-	2	3	1	1	-	-	-	1	3	1	-

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial(High)

Level: 5	Course Code: 4CE219VS1		Course Category: VSC		
Course Name	Surveying & Geomatics - Lab				
Credits	02	Total L:T:P Hours	0:0:4	Total SL Hours	--
Total Credit Hours	60 Hrs		60 Hrs		
SEE Marks	--	SEE Time	--	CIA Marks	--
EE Marks	25	PA Marks	25	Total Marks	50

Course Description:

Subject Code 4CE219VS1 Surveying & Geomatics Lab is a compulsory Vocational Science Course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to demonstrate hands-on experience with instruments and techniques for accurate field measurements, data collection, and map creation.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE219VS1.1	Perform chain, tape, EDM, compass and levelling measurements to determine distances, elevations and bearings accurately in field conditions	C-3 & P-5
4CE219VS1.2	Operate total station for angle measurement, traversing and contouring to generate precise survey data and maps.	C-6 & P-5
4CE219VS1.3	Analyze surveyed field data by performing profile levelling, cross-sections and GPS, to compute areas and interpret terrain effectively while participating in team or individual.	C-4, P-5 & A-2

List of Practicals:

Minimum Eight of mentioned below:

1. Measurement of Distance using Chain, Tape, and Electronic Distance Measurement (EDM).
2. Measurement of Bearings using Prismatic Compass and detection and correction of Local Attraction in Compass Surveying.
3. Determination of Reduced Levels (RL) by Differential Levelling Method.
4. Conducting Levelling Survey for Proposed Road Alignment (Profile Levelling).
5. Conducting Contour Survey and Preparation of Contour Map
6. Closed Traverse Survey using Total Station
7. Measurement of Horizontal and Vertical Angles using Total Station.
8. Drone Survey of Campus / Open Land for Mapping.
9. Establishment of GPS Control Points for Infrastructure Projects.
10. Preparation of Land Use Map using GIS Software

E Resources:

1. <https://sl-iitr.vlabs.ac.in/>

References

1. IS 1492 – Code of Practice for Surveying (PR1, PR2, PR3, PR4, PR5, PR6, PR7).
2. IS 12858 – Electronic Total Station – Specifications (PR1, PR7, PR8).
3. IS 1200 (Part 1) – Method of Measurement of Building and Civil Engineering Works (General Guidelines for Levelling) (PR4).
4. DGCA UAV Regulations (India) – Guidelines for Drone Survey and Mapping (PR9).

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE219VS1.1	3	-	-	2	3	-	-	-	-	-	-	3	-	2
4CE219VS1.2	3	-	-	3	3	-	-	-	-	-	-	3	2	2
4CE219VS1.3	3	2	-	3	3	2	-	1	2	-	1	3	2	2
4CE219VS1.CO	3	1	-	3	3	1	-	1	1	-	1	3	2	2

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial(High)

Level: 5	Course Code: 4SH220AE1	Course Category:	AEC
Course Name	Technical Writing		
Credits	02	Total	1:0:2
Total Credit Hours	60 Hrs	L:T:P Hours	45 Hrs
SEE Marks	--	SEE Time	--
EE Marks	--	PA Marks	50
		Total Marks	50

Course Description:

Subject Code 4SH220AE1 Technical Writing is common Ability Enhancement Course for Second Year B. Tech.

Course Objectives:

The objective of the course is to enhance students' ability to write effective technical documents, professional correspondence, and research-oriented content with clarity, accuracy, and ethical standards.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4SH220AE1.1	Apply principles of technical writing in engineering documents.	C-3 P-2 A-2
4SH220AE1.2	Apply technical writing skills to prepare professional documents.	C-4 P-2 A-2
4SH220AE1.3	Create ethical, well-structured technical and research documents using IEEE referencing for professional and academic communication.	C-3 P-3 A-3

Course Contents:

Unit 1	Fundamentals of Technical Writing: Nature and importance of technical communication, characteristics of technical writing, audience analysis, technical vocabulary, grammar and style, clarity and conciseness, paragraph structure, coherence, technical descriptions, instructions and manuals.	7 Hrs
Unit 2	Professional and Research Writing: Technical reports and documentation, structure of reports, abstracts and summaries, research papers, project proposals, resumes and cover letters, business emails, documentation ethics, plagiarism, referencing styles (IEEE), editing and proofreading.	8 Hrs

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Analysis of Technical Communication to Identify the nature, purpose of given technical documents and evaluate their effectiveness.
2. Editing technical text for clarity and brevity
3. Technical description of an engineering device/system
4. Writing step-by-step technical instructions
5. Preparation of structured technical reports
6. Resume and cover letter drafting

7. Technical report writing based on laboratory work, case study, or project work
8. Abstract and executive summary writing for technical documents
9. Referencing and citation using IEEE format
10. Editing, proofreading, and plagiarism check of technical documents

Text Books:

1. Rizvi A. M. & Patnaik P., Effective Technical Communication, McGraw Hill Education (India), New Delhi (Second Edition).
2. Verma S., Technical Communication for Engineers, Vikas Publishing House Pvt. Ltd., New Delhi (First Edition).
3. Misra P. & Tyagi K., Advanced Technical Communication, PHI Learning Pvt. Ltd., New Delhi (Second Edition).

Reference Books:

1. Chauhan G. S., Kashiramka S. & Thimmesh L., Technical Communication, Cengage Learning India Pvt. Ltd., New Delhi (First Edition).
2. Alred G. J., Brusaw C. T. & Oliu B., Handbook of Technical Communication, Oxford University Press, New Delhi (Second Edition).
3. IEEE Editorial Style Manual, IEEE Standards Association, IEEE, USA (Latest Edition).
4. Joseph G. & Joseph B., Grammar and Usage for Technical Communication, Cambridge University Press India, Delhi (First Edition).

E Resources:

1. NPTEL–SWAYAM, IIT Roorkee, Technical Communication for Engineers.
2. <https://owl.purdue.edu>
3. <https://ieeeauthorcenter.ieee.org>

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH220AE1.1	-	-	-	-	-	-	-	-		3	-			
4SH220AE1.2	-	-	-	-	-	-	-	-	3	3	-			
4SH220AE1.3	-	-	-	-	-	-	-	3		3	3			
4SH220AE1 CO	-	-	-	-	-	-	-	1	1	3	1			

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial(High)

List of Practicals:

Minimum eight practicals from the list mentioned below.

1. Categories a list of items (Laptop, Office Rent Deposit, Cash, Bank Loan, Software Licenses) into Assets, Liabilities, or Equity.
2. Use the Double-Entry System to record buying raw materials, paying technician wages, and receiving a client advance.
3. Identify discrepancies like uncashed cheques, bank charges, or direct deposits from clients.
4. Compare the Straight-Line Method vs. the Written Down Value (WDV) method (as per Indian Income Tax rules).
5. Distinguish between Direct Costs (raw materials, factory power) and Indirect Costs (office salary, marketing).
6. Analyze the Annual Report of an Indian tech giant (e.g., L&T or Tata Motors).
7. Calculate the Current Ratio (liquidity), Debt-to-Equity (solvency), and Return on Investment (ROI).
8. Input Fixed Costs (Rent, Machinery) and Variable Costs (Material per unit) into a spreadsheet to find the Break-Even Point.
9. Value the remaining stock after several purchases and sales using the First-In, First-Out (FIFO) method.
10. Enter 5 basic transactions into a trial version of Tally Prime or a cloud-based tool like Zoho Books.

Text Books:

1. S.N. Maheshwari S.K. Maheshwari & S.K. Maheshwari., Financial Accounting, Vikas Publishing House (Eleventh Edition)
2. N. Ramachandran, Ramkumar Kakani., Financial Accounting for Management, McGraw Hill Education (Sixth Edition)

Reference Books:

1. R. L. Gupta & U. K. Gupta., Financial Accounting, [Sultan Chand & Sons](#), (Ninth revised Edition)
2. Dr. Santanu Chakrabarty & Dr. Nilanjan Singha Roy., Accounting & Finance for engineering, Lawpoint Publications (Second Edition)
3. Bhushan Kumar Goyal., Accounting for Everyone, Taxmann Publications Pvt. Ltd (First Edition)

E Resources:

4. SWAYAM, Financial Accounting / Business Accounting
5. National Digital Library of India, <https://ndl.iitkgp.ac.in>
6. Tally Education, <https://tallyeducation.com>

Mapping of COs with POs & PSOs:

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4SH221EM1.1	2	2	-	-	-	-	-	-	-	-	-			
4SH221EM1.2	3	3	-	-	-	-	-	-	-	3	-			
4SH221EM1.3	2	3	-	-	3	-	-	-	-	3	-			

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: 5	Course Code: 4CE222VE1		Course Category: VEC		
Course Name	Environmental Science				
Credits	02	Total L:T:P Hours	2:0:0	Total SL Hours	30 Hrs
Total Credit Hours	60 Hrs		30 Hrs		
SEE Marks	30	SEE Time	2 Hrs	CIA Marks	20
EE Marks	--	PA Marks	--	Total Marks	50

Course Description:

Subject Code 4CE222VE1 Environmental Science is a Value Education course for Second Year B. Tech Civil Engineering.

Course Objectives:

The objective of this course is to develop understanding of environmental systems, natural resource management, ecological balance, and sustainable development practices to promote awareness and responsibility toward environmental protection and societal well-being.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE222VE1.1	Analyze renewable and non-renewable natural resources and associated problems to promote sustainable utilization for future generations.	C-4
4CE222VE1.2	Analyze food chains, webs, and ecological pyramids to evaluate ecological interactions and succession processes.	C-4
4CE222VE1.3	Examine shift from unsustainable to sustainable development to promote responsible resource planning for society.	C-3

Course Contents:

Unit 1	Renewable and non-renewable resources: Environmental Science, Definition, scope and importance, Need for public awareness, Renewable and non-renewable resources, Natural resources and associated problems. Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable life styles.	10 hrs
Unit 2	Ecosystem: 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: Forest ecosystem, Grassland ecosystem, Desert ecosystem.	10 hrs
Unit 3	Social Issues & Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of	10 hrs

	people; its problems and concerns. Environmental ethics: Issues and possible solutions, 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.	
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Text Books:

1. Suresh K. Dhameja, Environmental Studies, Katson Books
2. Benny Joseph, Environmental Studies, McGraw Hill Education

Reference Books:

1. Gilbert M. Masters & Wendell Ela, Introduction to Environmental Engineering and Science, Pearson Education
2. William Cunningham & Mary Cunningham, Environmental Science, McGraw Hill

E Resources:

1. <https://www.vlab.co.in/broad-area-civil-engineering>

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE222VE1.1	3	2	-	-	-	2	2	-	-	-	-	-	-	-
4CE222VE1.2	3	2	-	-	-	3	2	-	-	-	-	-	1	-
4CE222VE1.3	3	2	-	-	-	3	3	-	-	-	-	-	1	-
4CE222VE1.CO	3	2	-	-	-	3	3	-	-	-	-	-	1	-

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial(High)

Level: 5	Course Code: 4CE223DH1			Course Category: DH	
Course Name	Smart City Infrastructure and Digital Integration				
Credits	04	Total L:T:P Hours	4:0:0	Total SL Hours	60 Hrs
Total Credit Hours	120 Hrs		60 Hrs		
SEE Marks	60	SEE Time	3 Hrs	CIA Marks	40
EE Marks	--	PA Marks	--	Total Marks	100

Course Description:

Subject Code 4CE223DH1 Smart City Infrastructure and Digital Integration is an Honours / Double minor course (L 5) offered by department of Civil Engineering for Second Year B. Tech., all disciplines.

Course Objectives:

The objective of this course is to provide students with fundamental knowledge of smart city infrastructure technologies, including IoT, communication systems, data analytics, GIS, AI/ML, and cybersecurity, for planning, monitoring, and managing modern digital civil infrastructure systems.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4CE223DH1.1	Apply knowledge of IoT, sensors, actuators, and monitoring systems for smart bridges, buildings, roads, and pavements.	C-3
4CE223DH1.2	Analyze communication requirements in civil infrastructure systems for applications such as smart lighting, storm water monitoring, and smart grids.	C-4
4CE223DH1.3	Interpret real-time urban infrastructure data using IoT, SCADA, cloud, and edge computing platforms for decision-making and alert generation.	C-2
4CE223DH1.4	Apply GIS and remote sensing tools for land-use planning, site selection, drainage mapping, and flood risk assessment.	C-3
4CE223DH1.5	Illustrate civil engineering datasets for applications such as crack detection, traffic prediction, and structural failure forecasting through AI/ML.	C-4
4CE223DH1.6	Explain cybersecurity principles and disaster recovery strategies for smart public infrastructure systems.	C-2

Course Contents:

Unit 1	IoT Applications in Civil Infrastructure: Role of IoT in civil engineering and smart cities, Types of sensors used in civil systems: Strain gauges, accelerometers, tilt sensors, temperature and humidity sensors, Applications: Smart bridges (structural health monitoring), Buildings (energy management, occupancy), Roads and pavements (traffic sensing, rutting detection), Basics of actuators in smart construction	10 hrs
Unit 2	Communication Technologies for Infrastructure Connectivity: Communication needs in infrastructure systems: remote monitoring, alerts, automation, Selection of communication protocols for civil systems (MQTT, Zigbee, Modbus), Applications: Smart lighting systems, connected stormwater sensors, smart grids, Challenges: range, power consumption, signal interference in real-world construction sites	10 hrs
Unit 3	Data Management for Urban Civil Systems: Introduction to civil data sources: IoT sensors, cameras, GPS, SCADA systems, Basics of cloud computing in smart city platforms (examples: AWS, Bhuvan, SmartNet), Edge computing for latency-sensitive systems: Traffic signals, flood alerts, Urban infrastructure analytics: Patterns, trends, and alerts in real-time data	10 hrs
Unit 4	GIS and Remote Sensing for Civil Engineering: Basics of GIS for civil engineers: map layers, attributes, spatial queries, Data sources: Satellite images, drones, LiDAR, GIS applications: Land-use planning, site selection, Utility and drainage network mapping, Flood risk zoning, urban expansion studies, Remote sensing for environmental monitoring, Hands-on introduction to open tools: QGIS, Google Earth Engine	10 hrs
Unit 5	Artificial Intelligence and Machine Learning in Civil Systems: Basics of AI and ML: civil-friendly definitions, Data preprocessing and civil-relevant datasets, Applications: Crack detection in pavements and buildings (image-based ML), Traffic flow prediction and congestion analysis, Structural failure prediction using past data	10 hrs
Unit 6	Cyber security and Data Privacy in Public Infrastructure: Data privacy concerns in public surveillance, citizen services, Encryption, firewalls, and secure data transmission techniques, Legal frameworks: Indian IT Act, ISO 27001, BIS smart infrastructure standards, Disaster recovery and data backup plans in critical urban systems (e.g., metro control)	10 hrs

Text Books

1. Internet of Things (IoT): Architecture and Applications by Raj Kamal
2. Remote Sensing and GIS by B.C. Punmia, Ashok Jain
3. Applications of Artificial Intelligence in Civil Engineering by Mohd. Shadab, Ankit Kumar

Reference Books:

1. Artificial Intelligence and Machine Learning by Vinod Chandra S.S., Anand Hareendran
2. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole, Sunit Belpure

E Resources:

1. <https://upskilldevelopment.com/urban-innovation-management-and-smart-cities-course>

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE223DH1.1	3	-	2	-	-	-	-	-	-	-	-	-	-	-
4CE223DH1.2	2	3	2	-	-	-	-	-	-	-	-	-	2	-
4CE223DH1.3	2	3	2	-	2	-	-	-	-	-	1	-	2	-
4CE223DH1.4	3	3	3	-	2	2	-	-	-	-	-	-	3	-
4CE223DH1.5	2	3	2	-	2	-	-	-	-	-	-	-	-	-
4CE223DH1.6	1	-	-	-	-	2	-	-	-	-	3	-	-	-
4CE223DH1.CO	2	2	2	-	2	1	-	-	-	-	1	-	2	-

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial(High)

Level: 5	Course Code: 4CE223DH2		Course Category: DH		
Course Name	Electrical Systems in Building				
Credits	04	Total L:T:P Hours	4:0:0 60 Hrs	Total SL Hours	60 Hrs
Total Credit Hours	120 Hrs				
SEE Marks	60	SEE Time	3 Hrs	CIA Marks	40
EE Marks	--	PA Marks	--	Total Marks	100

Course Description:

Subject Code 4__223DH2 Electrical Systems in Building is an Honours / Double minor course (L 5) offered by department of Civil Engineering for Second Year B. Tech., all disciplines.

Course Objectives:

The objective of this course is to apply principles of lighting design, energy efficiency, and electrical services to ensure safety, reliability, and sustainability.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
4__223DH2.1	Apply electrical engineering principles and standards to design safe and reliable electrical systems in buildings.	C-3
4__223DH2.2	Analyse load requirements and develop single-line diagrams for efficient power distribution.	C-4
4__223DH2.3	Categorize appropriate wiring methods, cables, and protection devices to ensure proper installation based on building requirements.	C-4
4__223DH2.4	Analyse electrical services including lighting, illumination levels, emergency, and automation systems to improve building functionality and occupant safety.	C-4
4__223DH2.5	Examine commercial and residential electrical systems with backup power solutions to perform basic testing and performance evaluation of electrical equipment.	C-3
4__223DH2.6	Incorporate renewable energy options, energy efficiency measures, and sustainability practices to enhance modern building electrical system performance.	C-4

Course Contents:

Unit 1	Fundamentals of Building Electrical Systems: Introduction to building electrification, Standards, codes, and regulations (NEC, NBC, IEC, IS codes), Estimation of electrical loads in residential, commercial, and industrial buildings, Diversity factor, demand factor, load factor, maximum demand estimation	10 hrs

Unit 2	Power Distribution in Building: Single-line diagrams (SLD) for building power distribution, Substations for large buildings (11 kV/433 V), transformer sizing, Low-voltage (LV) and medium-voltage (MV) distribution systems, Panel boards, distribution boards, feeders, bus-bars, rising mains, Earthing and grounding methods in buildings	10 hrs
Unit 3	Wiring Systems and Protection: Types of wiring (conduit, casing-capping, concealed, raceways, cable trays), Selection of wires and cables (IS/IEC standards), Protection devices: MCB, MCCB, RCCB, ELCB, fuses, surge protection, Short-circuit & overload protection, coordination of protective devices, Energy metering and billing in buildings	10 hrs
Unit 4	Electrical Services in Buildings: Lighting systems: design principles, Lumen method, energy-efficient lighting, LED technology, Indoor and outdoor lighting types, Emergency power supply and evacuation lighting, Lighting automation: Sensors, dimmers, smart lighting	10 hrs
Unit 5	Power systems and equipment: Power outlets and socket distribution, UPS, DG sets, battery banks for backup power , Electrical Installation Testing (Insulation, continuity, earth resistance, etc.), Case study: Electrical layout of a commercial/residential building	10 hrs
Unit 6	Modern Trends and Sustainability: Renewable energy integration in buildings: rooftop solar PV, hybrid systems, Green building concepts (LEED, GRIHA), Energy auditing and conservation techniques in buildings, Smart grids and IoT-based building energy management, Case studies: Intelligent and net-zero energy buildings	10 hrs

Text Books

1. Electrical Wiring, Estimation & Costing by S. L. Uppal, J. B. Gupta, Khanna Publishers
2. Design of Electrical Installation by H. P. Garg, Khanna Publishers
3. Electrical Installation Design Guide by Institution of Engineering and Technology
4. Electrical Systems in Buildings by S. David Hughes

Reference Books:

1. Handbook on Electrical Design Details by R. B. Gupta, Katson Books
2. Building Services Handbook by Fred Hall & Roger Greeno, Pearson
3. Electrical Power Systems by C. L. Wadhwa , New Age International
4. Energy Efficiency in Electrical Systems by J. Parameshwaran, CRC Press, India edition
5. IS Codes (BIS standards): IS 732 (Electrical wiring installations), IS 3043 (Earthing), IS 1646 (Fire safety of electrical systems), National Building Code (NBC), National Electrical Code (NEC India).

E Resources:

1. vlab.co.in
2. OpenStax: Introduction to Electricity and Magnetism

Mapping of COs with POs

CO	PO											PSO		
	1	2	3	4	5	6	7	8	9	10	11	1	2	3
4CE223DH2.1	3	-	2	-	-	-	-	-	-	-	-	-	-	-
4CE223DH2.2	2	3	2	-	-	-	-	-	-	-	-	-	2	-
4CE223DH2.3	2	3	2	-	2	-	-	-	-	-	1	-	2	-
4CE223DH2.4	3	3	3	-	2	2	-	-	-	-	-	-	3	-
4CE223DH2.5	2	3	2	-	2	-	-	-	-	-	-	-	-	-
4CE223DH2.6	1	-	-	-	-	2	-	-	-	-	3	-	-	-
4CE223DH2.CO	2	2	2	-	2	1	-	-	-	-	1	-	2	-

Correlation levels-1: Slight (Low),2: Moderate (Medium), 3: Substantial(High)

Level: 5	Course Code: 5CE224EC1		Course Category: EC		
Course Name	Fundamentals of Structural Design				
Credits	04	Total L:T:P Hours	2:0:4	Total SL Hours	30 Hrs
Total Credit Hours	120 Hrs		90 Hrs		
SEE Marks	30	SEE Time	2 Hrs	CIA Marks	20
EE Marks	25	PA Marks	25	Total Marks	100

Course Description:

Subject Code 5CE224EC1 Fundamentals of Structural Design is an Optional Exit Course (L 5) for Second Year B. Tech. Civil Engineering.

Course Objectives:

The objective of this course is to build foundational skills in structural systems, analysis of beams/columns, and design of RCC and steel members to prepare students for practical structural engineering applications.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
5CE224EC1.1	Apply load combinations per IS 875 and SFD/BMD basics to assess structural member behaviour under design loads.	C-3
5CE224EC1.2	Generate SFD & BMD for beams under various loads to measure internal forces and structural behaviour.	C-6 & P-4
5CE224EC1.3	Design singly and doubly reinforced beams and axial tension/compression members to develop safe RCC structural elements by appreciating to safety norms.	C-6 & A-3

Course Contents:

Unit 1	Introduction to Structural Systems & Loads: Structural Systems: Types of structures: load-bearing, framed, truss, shell, and composite systems, Structural components, Structural behavior: bending, shear, torsion, axial compression/tension. Loads and Load Combinations (as per IS 875), Shear Force & Bending Moment (SFD/BMD) basics with simple problems.	10 hrs
Unit 2	Analysis of Structural Members: Analysis of Beams: Bending stress and shear stress concepts. SFD & BMD for beams with various loads. Deflection calculation (standard formulae), Analysis of Columns: Short and long columns. Euler's buckling, effective length. Axial, eccentric loading. Introduction to Structural Analysis Software Basic usage of tools (STAAD Pro / ETABS / SAP2000 or open-source alternatives).	10hrs
Unit 3	Fundamentals of Design (RCC & Steel): Limit State Design Concepts: Working Stress Method vs. Limit	10 hrs

	State Method, Partial safety factors, Design of singly reinforced and doubly reinforced beams. Design of axial tension/compression members. Introduction to slab design. Steel Design (as per IS 800): Bolted and welded joints basics.	
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List of Practicals:

Minimum ten practicals from the list mentioned below:

1. Study of Structural Systems and Components
2. Study of Structural Behavior Under Loads
3. Determination of Design Loads as per IS 875
4. Study of Preparation of Shear Force and Bending Moment Diagrams
5. Determination of Bending and Shear Stresses in Beams
6. Study of Shear Force and Bending Moment Diagrams for Complex Loading
7. Determination of Beam Deflections Using Analytical Methods
8. Study of Column Behavior and Buckling Analysis
9. Determination of Behavior of an Eccentrically Loaded Column
10. Study of Structural Analysis Software (STAAD/ETABS/SAP)
11. Study of Design of RCC Beam by Limit State Method
12. Study of Design of Steel Structural Components

Text Books:

1. R. S. Khurmi & J. K. Gupta – Theory of Structures – S. Chand Publishing
2. C. K. Wang & K. M. Salmon – Reinforced Concrete Designer's Handbook – Wiley
3. S. K. Duggal – Structural Steel Design – McGraw-Hill Education

Reference Books:

1. G. B. Junnarkar, Basic & Applied Soil Mechanics & Foundation Engineering / Structural Engineering – Everest Publishing House
2. Subramanian N. – Design of Steel Structures – Oxford University Press

E Resources:

1. <https://bmtpc.org>
2. [ps://www.coursera.org/courses?query=structural%20engineering](https://www.coursera.org/courses?query=structural%20engineering)

Mapping of COs with POs and PSOs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
5CE224EC1.1	3	2	-	-	-	-	-	-	-	-	-
5CE224EC1.2	3	2	-	3	-	-	-	-	-	-	-
5CE224EC1.3	3	2	3	3	3	2	2	-	-	-	-
5CE224EC1.CO	3	2	1	2	1	1	1	-	-	-	-

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial(High)

Level: 5	Course Code: 5CE225EC1		Course Category: EC		
Course Name	Quantity Survey and Estimation				
Credits	04	Total L:T:P Hours	2:0:4 90 Hrs	Total SL Hours	30 Hrs
Total Credit Hours	120 Hrs				
SEE Marks	30	SEE Time	2 Hrs	CIA Marks	20
EE Marks	25	PA Marks	25	Total Marks	100

Course Description:

Subject Code 5CE225EC1 Quantity Survey and Estimation is an Optional Exit Course (L 5) for Second Year B. Tech. Civil Engineering.

Course Objectives:

The objective of this course is to develop fundamental skills in quantity surveying, estimation of building components, rate analysis, costing, and preparation of essential documentation required for construction projects using standard procedures and tools.

Course Outcomes:

After completing the course students will be able to:

CO	Course Outcome	Domain Level
5CE225EC1.1	Compose accurate measurement and abstract sheets using standard rules of quantity take-off to enable systematic documentation and quantity control.	C-6
5CE225EC1.2	Calculate quantities for major components using building drawings for efficient preparation of complete building estimates.	C-5 & P-2
5CE225EC1.3	Perform rate analysis for common construction items using market data to determine fair and competitive project costing.	C-3 & P-5

Course Contents:

Unit 1	Basics of Quantity Surveying & Units of Measurement Introduction to Quantity Surveying – roles and responsibilities, Types of estimates: Preliminary, Plinth area, Cubical, Detailed estimates, Principles of taking out quantities, Types of drawings needed, Measurement sheets, abstract sheets, Introduction to SSR/DSR/Local Schedule of Rates.	10 hrs
Unit 2	Estimation of Building Components Estimation of: Earthwork for buildings, roads, dams etc. Brick & Stone masonry, Concrete works (PCC, RCC), Flooring, plastering, painting, Doors and windows, Bar Bending Schedule (BBS) for RCC building.	10 hrs
Unit 3	Rate Analysis, Costing & Practical Documentation Concept of rate analysis, Rate analysis for basic items (Earthwork, Concrete, Masonry, Plastering), Market survey basics, Introduction to tendering & contracts, Use of simple estimation tools/software (Excel templates/Open-source QS tools).	10 hrs

List of Practicals:

Minimum ten practicals from the list mentioned below:

1. Reading & interpretation of civil engineering drawings (plans, elevations, sections).
2. Preparation of a measurement sheet for a sample room/building.
3. Taking quantities of earthwork (cut/fill) from a simple plan.
4. Estimating foundation works – excavation, PCC, masonry, RCC.
5. Estimation of brick masonry for walls in a small building.
6. Estimation of concrete works—slab/beam/column.
7. Estimation of finishes—plastering, flooring, painting for a room.
8. Preparation of Bar Bending Schedule (BBS) for a slab or beam.
9. Preparing Abstract Sheet & BOQ for a building portion.
10. Rate Analysis (earthwork, masonry, concrete).
11. Market rate survey (materials & labour) and preparation of rate sheet.
12. Complete estimate (quantity + cost) for a small residential unit using Excel or QS tool.

Text Books:

1. B.N. Dutta, Estimating and Costing in Civil Engineering, UBS Publishers
2. Rangwala, Estimating and Costing, Charotar Publishing House
3. M. Chakraborti, Estimating, Costing, Specification and Valuation, S. Chand Publishing

Reference Books:

1. P.S. Gahlot & B.M. Dhir, Construction Planning and Management, New Age International
2. Peurifoy & Oberlender, Estimating Construction Costs, McGraw-Hill
3. M. Akhtar, Quantity Surveying & Contract Management, McGraw Hill

E Resources:

1. <https://cpwd.gov.in>
2. <https://mahapwd.com>
3. <https://etenders.gov.in>

Mapping of COs with POs and PSOs

CO	PO										
	1	2	3	4	5	6	7	8	9	10	11
5CE225EC1.1	3	2	2	-	-	-	-	-	-	2	-
5CE225EC1.2	3	2	2	-	-	-	-	-	-	-	-
5CE225EC1.3	3	2	-	3	-	2	2	-	-	-	-
5CE225EC1.CO	3	2	2	1	-	1	1	-	-	1	-

Correlation levels-1: Slight (Low), 2: Moderate (Medium), 3: Substantial(High)